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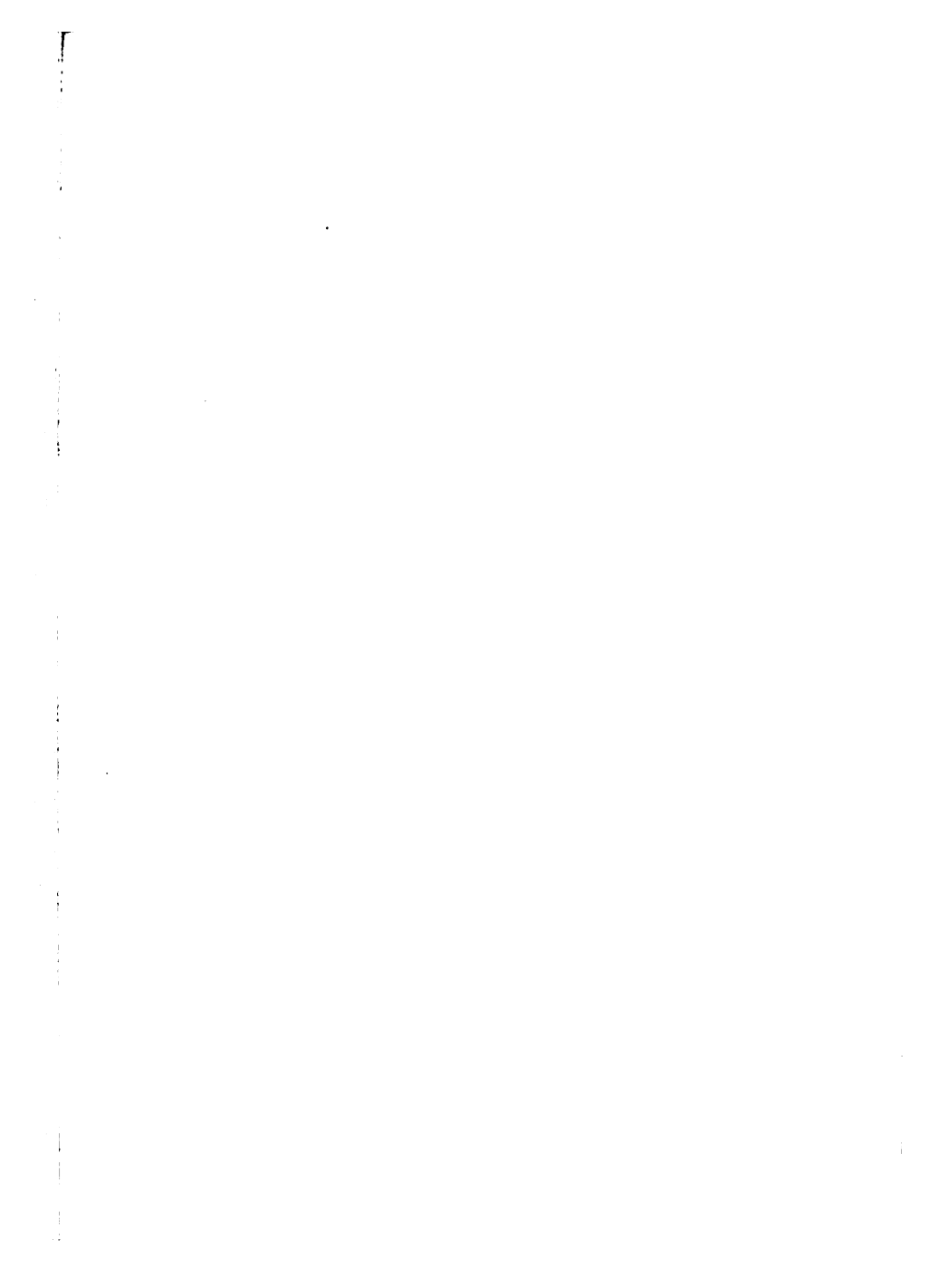


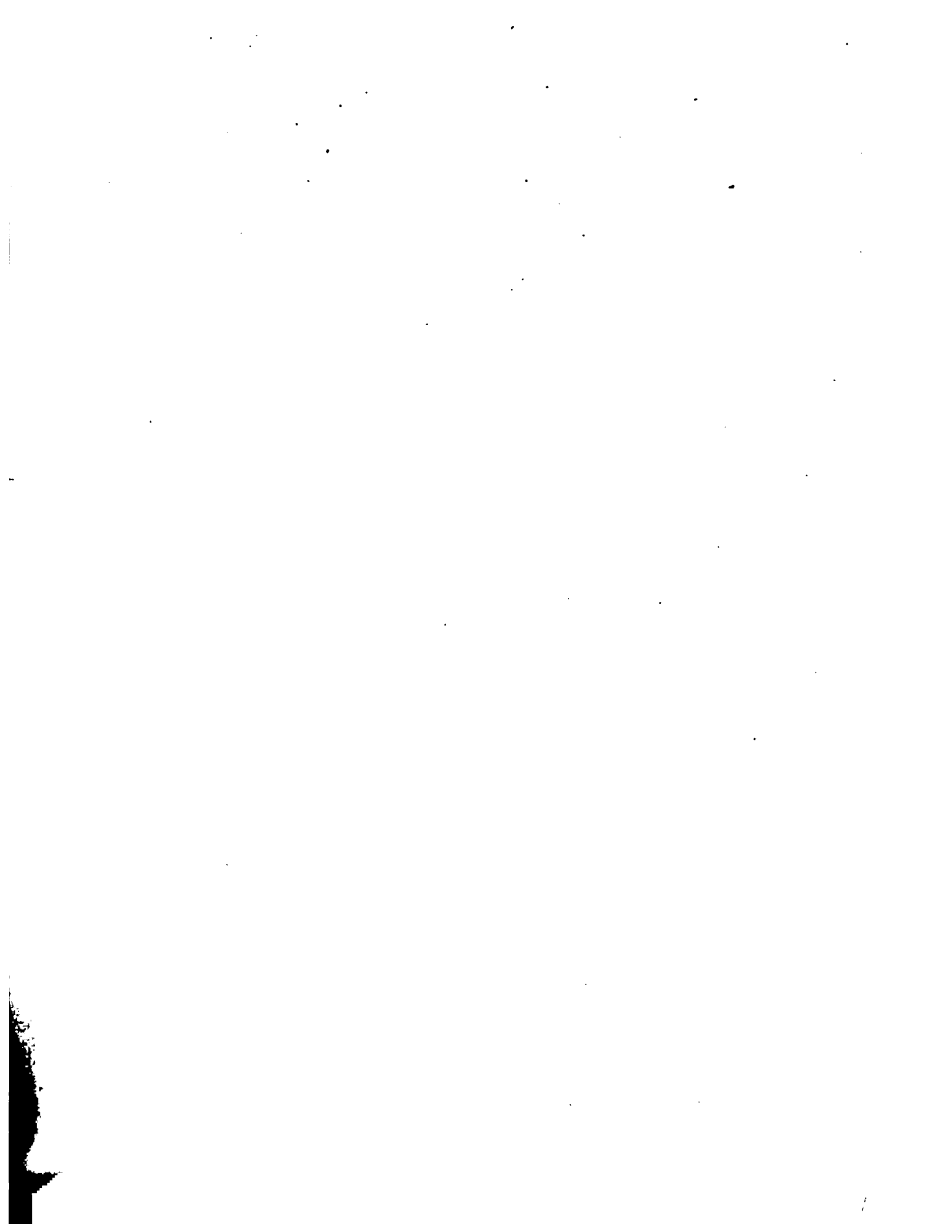
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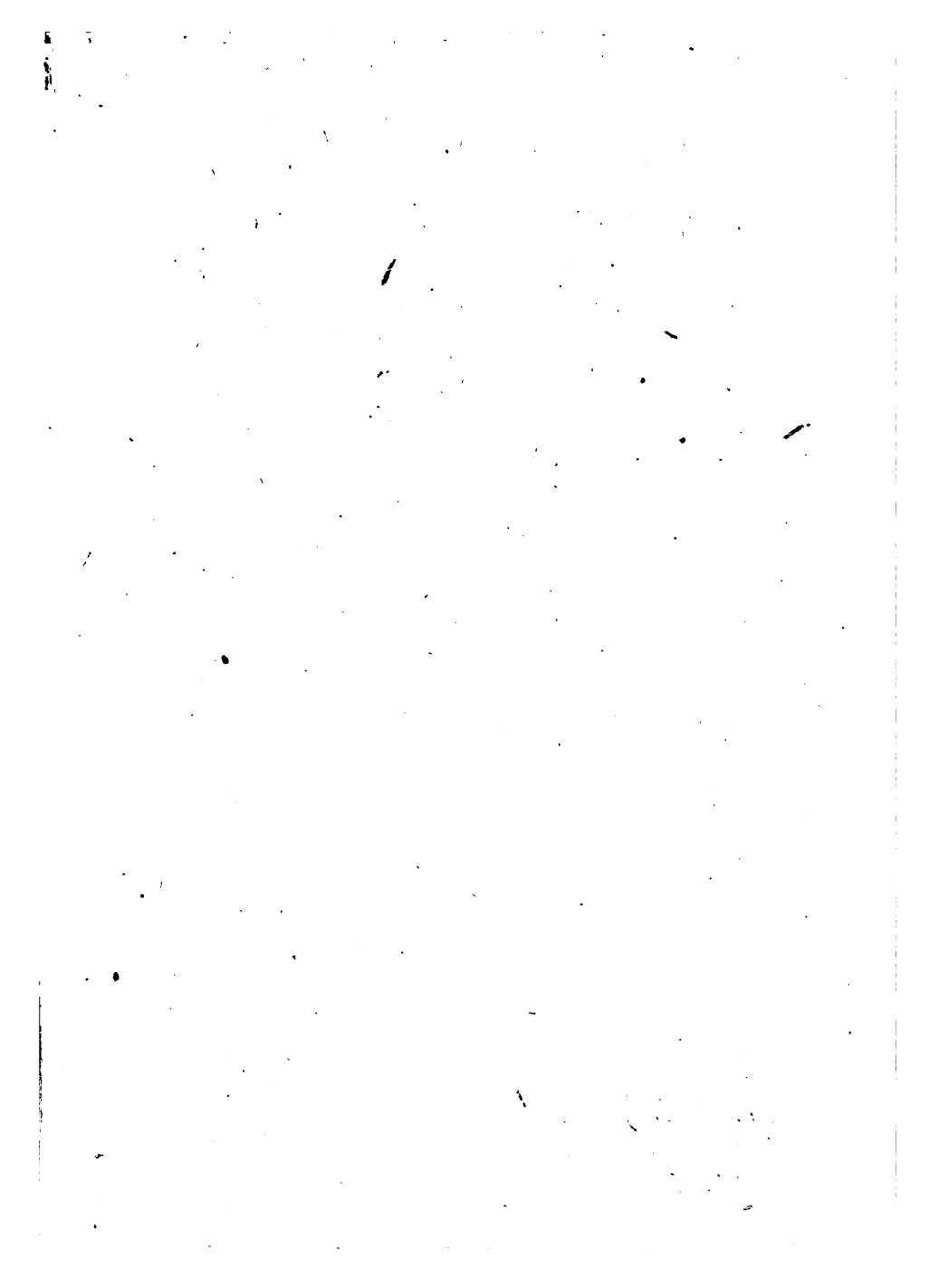












1. Automatic. - Jacobson, 1944,

89

PHILIPPINE INDUSTRIAL ARITHMETICS

INTERMEDIATE ARITHMETIC

PARTS II AND III

BY

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FORMERLY TEACHER OF PHYSICS IN THE PHILIPPINE NORMAL
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FORMERLY TEACHER OF MATHEMATICS IN THE
PHILIPPINE NORMAL SCHOOL

NEW REVISED EDITION

ILLUSTRATED



YONKERS-ON-HUDSON, NEW YORK
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PREFACE

THE Mercer-Bonsall Intermediate Arithmetic, in two books, follows the Bonsall-Mercer Primary Arithmetic, Part III, and is designed for the three years of the intermediate course; Part I covers the arithmetic work for the fifth grade, and Parts II and III, in one book, cover the work for the sixth and seventh grades, respectively.

Part II offers a brief review of the fundamental operations, gives the final treatment to common fractions, decimals, the metric system, longitude and time, and most of the applications of percentage, and places particular emphasis upon the subject of practical measurements and the plan and purpose of the Postal Savings Bank system.

Part III presents practical short methods of computation, gives adequate treatment to such applications of percentage as do not appear in Part II, and introduces ratio and proportion, powers and roots, and the measurements of the simple solids.

Much time and energy have been expended in gathering reliable information concerning the business customs and industries of the Philippines. This information has furnished rich material from which a wide variety of practical and interesting problems have been made. The plan adopted in the preceding books of this series, of presenting essential facts in clear and concise form, has been followed in the present volume.

23 Mar. 1. 7

For helpful suggestions the authors are indebted to the following superintendents and teachers of Philippine experience: Supt. E. R. Hay, Mr. Graham Kemper, Miss V. Louise Herrick, Supt. W. K. Bachelder, Mr. W. I. Chapman, Supt. H. A. Bordner, Mr. Peyton Carter, and Mrs. Emma Weston. Thanks are due also to Mr. Benjamin F. Wright of the Bureau of Posts.

CONTENTS

PART II

	PAGE
REVIEW OF FUNDAMENTAL PROCESSES	I
Notation and Numeration	I
Addition	2
Subtraction	5
Multiplication	6
Division	8
Review Problems	10
FACTORS AND MULTIPLES	13
Factors	13
Multiples	15
Cancelation	16
FRACTIONS	17
Reduction of Fractions to Higher or Lower Terms	17
Reduction of Whole or Mixed Numbers to Improper Fractions	18
Reduction of Improper Fractions to Whole or Mixed Numbers	19
Least Common Denominator	20
Addition and Subtraction of Fractions	20
Multiplication of Fractions	24
Division of Fractions	26
Complex Fractions	30
Fractional Relations	30
Review of Fractions	32
DECIMALS	33
Reduction of Decimals	34
Addition and Subtraction of Decimals	35
Multiplication of Decimals	37
Useful Parts of a Peso	38
Division of Decimals	39
Review of Decimals	40
BILLS AND ACCOUNTS	44
METRIC SYSTEM	47
Metric Measures of Length	47
Metric Measures of Surface	51
Metric Measures of Volume	55
Metric Measures of Capacity	57
Metric Measures of Weight	58
Specific Gravity	59
Metric Review Problems	60

	PAGE
MEASURES OF TIME	64
Reduction of Time Measures	64
Addition of Time Measures	66
Subtraction of Time Measures	66
Multiplication of Time Measures	68
Division of Time Measures	68
LONGITUDE AND TIME	69
Circular Measure	69
PRACTICAL MEASUREMENTS	75
Review Problems	78
Sawali	80
Nipa Roofing	81
Iron Roofing	82
Lumber	83
Concrete Work	85
Brick and Stone Work	86
Miscellaneous Problems	87
Review Questions	90
PERCENTAGE AND ITS APPLICATIONS	91
Percentage	91
Gain and Loss	100
Commission	102
Trade Discount	105
Taxes	107
Duties or Customs	109
Insurance	111
Interest	114
Partial Payments	124
Compound Interest	126
Bank Discount	127
POSTAL SAVINGS BANKS	129
GENERAL REVIEW	134
EXAMINATION QUESTIONS	148

PART III

SHORT METHODS	153
REVIEW	156
CORPORATIONS	162
TRUE DISCOUNT	166
RATIO AND PROPORTION	168
Ratio	168
Simple Proportion	170
PARTNERSHIP	174

CONTENTS

vii

	PAGE
REVIEW	176
POWERS AND ROOTS	189
Powers	189
Roots	190
Square Root	191
Applications of Square Root	196
LINES, SURFACES, AND VOLUMES	199
Lines	199
Surfaces	199
Volumes	205
REVIEW	212
GENERAL REVIEW	215
REVIEW OF COMMON FRACTIONS	220
REVIEW OF DECIMAL FRACTIONS	222
REVIEW OF METRIC MEASURES	223
REVIEW OF PERCENTAGE	224
REVIEW OF RATIO AND PROPORTION	227
REVIEW OF SURFACES AND VOLUMES	228
MISCELLANEOUS PROBLEMS	230
EXAMINATION QUESTIONS	242
REDUCTION	249
THE EQUATION	251
Introduction to the Equation	251
Principles used in the Solution of the Equation	254
Solution of Problems by Means of the Equation	256
SPANISH TABLES OF MEASURE	272
ENGLISH TABLES OF MEASURE	273
ANSWERS	274

SUGGESTIONS TO TEACHERS

In order to make the arithmetic in the intermediate grades of the greatest practical benefit to the pupil, the teacher will find it necessary to give especial attention to the particular occupations that are prominent in the vicinity. The collecting of information concerning the business operations actually met with in his community, and the solving of problems, the making out of bills, etc., such as the boat-builder, merchant, and others of his acquaintance find necessary, will greatly increase the pupil's interest in the study of arithmetic.

The pupil might be requested to collect information regarding the building of a house—to find out the amount of material needed, the prices of the same, the cost of labor, etc.—and to make out a bill for the whole.

If the district is agricultural, the particular crop raised will furnish rich material for problems. The cost of preparation of the soil, of planting, cultivating, harvesting, and marketing, the amount produced per hektar, the price obtained for the produce, etc., may be used for this purpose.

In a seacoast town or city, fishing and boat-building might well be investigated. The amount and value of the various exports and imports, the units of measure involved, the cost of shipping, the time required for transportation, the number of men employed on the wharves, etc., vary so greatly in the different localities that original investigation by teacher and pupils will add very much to the value of the problems made and discussed.

Other local interests, such as rope-making, dyeing and bleaching, hat and mat weaving, working in silver, mining, etc., should be given due consideration.

The making out of household accounts, and dressmakers' and tailors' bills, with local prices inserted, would be of practical value in any community.

INTERMEDIATE ARITHMETIC

PART II

Review of fundamental processes ; factors and multiples ; common fractions ; decimals ; bills and accounts ; metric system ; longitude and time ; practical measurements ; percentage and its applications ; Postal Savings Banks.

REVIEW OF FUNDAMENTAL PROCESSES

As an aid to the advanced work, a review of the fundamental operations is recommended. The first 12 pages of this volume are designed to furnish material for such a review. If the review is not thought to be desirable, it may, of course, be omitted.

NOTATION AND NUMERATION

1. Oral.

Notation is the writing of numbers.

Numeration is the reading of numbers.

Notation by figures was introduced into Europe by the Arabs ; therefore it is called **Arabic** notation.

Notation by letters is called **Roman** notation from the ancient Romans who used it.

It is the *place value* of the figures that makes the Arabic system better than the Roman. In the Roman system VIII means $5 + 3$, while 53 in the Arabic system means 5 *tens* + 3, the 5 having the value *five* and the place value *tens*.

1. How many different figures are used in the Arabic system?
2. Give the name of each period in 2,304,568,721. Give the place value of each figure.

Any number can be expressed in the Roman notation by the use of the following capital letters, combined according to the three principles given below :

<i>Letters :</i>	I	V	X	L	C	D	M
<i>Values :</i>	1	5	10	50	100	500	1000

- (1) Repeating I, X, C, or M repeats its value ; XX = 20.
 - (2) When a letter is placed before another of greater value, its value is taken from that of the greater ; IX = 9, XL = 40.
 - (3) When a letter follows another of greater value their values are added ; XI = 11, LII = 52.
3. Read the following : XVII, XXV, LXVI, DCIX, XCV.
 4. Write in Roman notation : 37, 84, 111, 1008, 1890, 2195.
 5. Write in both systems the number of the present year.

2. Oral.

ADDITION

Give sums at sight :

- | | | | | | |
|---|---|---|---|---|---|
| 1. $\begin{array}{r} 25 \\ 35 \\ \hline 60 \end{array}$ | 2. $\begin{array}{r} 90 \\ 30 \\ \hline 120 \end{array}$ | 3. $\begin{array}{r} 76 \\ 11 \\ \hline 87 \end{array}$ | 4. $\begin{array}{r} 41 \\ 15 \\ \hline 56 \end{array}$ | 5. $\begin{array}{r} 75 \\ 75 \\ \hline 150 \end{array}$ | 6. $\begin{array}{r} 71 \\ 16 \\ \hline 87 \end{array}$ |
| 7. $\begin{array}{r} 220 \\ 220 \\ \hline 440 \end{array}$ | 8. $\begin{array}{r} 331 \\ 331 \\ \hline 662 \end{array}$ | 9. $\begin{array}{r} 406 \\ 406 \\ \hline 812 \end{array}$ | 10. $\begin{array}{r} 321 \\ 333 \\ \hline 654 \end{array}$ | 11. $\begin{array}{r} 415 \\ 215 \\ \hline 630 \end{array}$ | 12. $\begin{array}{r} 612 \\ 212 \\ \hline 824 \end{array}$ |
| 13. $\begin{array}{r} 227 \\ 8 \\ \hline 235 \end{array}$ | 14. $\begin{array}{r} 345 \\ 9 \\ \hline 354 \end{array}$ | 15. $\begin{array}{r} 625 \\ 16 \\ \hline 641 \end{array}$ | 16. $\begin{array}{r} 836 \\ 24 \\ \hline 860 \end{array}$ | 17. $\begin{array}{r} 809 \\ 18 \\ \hline 827 \end{array}$ | 18. $\begin{array}{r} 423 \\ 543 \\ \hline 966 \end{array}$ |
| 19. $\begin{array}{r} 416 \\ 316 \\ \hline 732 \end{array}$ | 20. $\begin{array}{r} 450 \\ 450 \\ \hline 900 \end{array}$ | 21. $\begin{array}{r} 225 \\ 275 \\ \hline 500 \end{array}$ | 22. $\begin{array}{r} 175 \\ 175 \\ \hline 350 \end{array}$ | 23. $\begin{array}{r} 105 \\ 145 \\ \hline 250 \end{array}$ | 24. $\begin{array}{r} 409 \\ 508 \\ \hline 917 \end{array}$ |

25. Define *addition* ; *addends* ; *sum*.

3. Written.

Add 53, 37, 34, 54, 66, 45, 25, 87.

$$\begin{array}{r}
 53 \} 10 \\
 37 \} \\
 11 \{ 34 \\
 54 \} 10 \\
 10 \{ 66 \\
 45 \} 10 \\
 10 \{ 25 \\
 87 \\
 \hline
 41 \\
 36 \\
 \hline
 401
 \end{array}$$

Mentally group the figures which have the sum of 10 or 11, and add rapidly by groups.

Thus, in the units' column of this exercise, beginning at the bottom, think, "7, 17, 27, 31, 41," and in the tens' column think, "10, 20, 31, 36."

In adding long columns it is advisable to retain the sum of each column so that an error in adding can be easily found.

The following groups should be well fixed in mind :

$$\begin{array}{cccccc}
 5 \} & 6 \} & 7 \} & 8 \} & 9 \} & 3 \} & 4 \} \\
 5 \} & 4 \} & 3 \} & 2 \} & 1 \} & 4 \} & 1 \}
 \end{array}$$

etc., for 10.

$$\begin{array}{cccccc}
 6 \} & 7 \} & 8 \} & 9 \} & 3 \} & 5 \} & 2 \} \\
 5 \} & 4 \} & 3 \} & 2 \} & 3 \} & 4 \} & 3 \} \\
 & & & & 5 \} & 2 \} & 6 \}
 \end{array}$$

etc., for 11.

Drill on the following exercises until you can add each one up and down (to test) in one minute or less :

1. 46,769	2. 56,767	3. 55,798	4. P 844.39
38,453	56,492	23,546	337.85
32,357	74,328	98,616	423.46
69,796	34,746	67,594	464.48
53,862	82,744	44,785	883.25
<u>23,674</u>	<u>15,608</u>	<u>36,924</u>	<u>117.83</u>
5. 23,855	6. P 747.45	7. P 78.78	8. P 82.79
47,659	74.39	535.85	952.47
46,484	558.34	765.75	566.64
7,697	688.47	868.45	633.28
73,743	785.74	998.55	488.95
97,678	36.68	87.50	769.87
<u>37,250</u>	<u>918.25</u>	<u>613.71</u>	<u>827.30</u>

It is important that the pupils acquire the ability to add numbers written in horizontal lines.

In adding numbers written horizontally care should be exercised to combine only units of the same order. Add from left to right and verify the work by adding from right to left. Grouping may be used to advantage in horizontal addition.

Add horizontally:

9. 3, 7, 8, 5, 9, 6, 3, 7, 5, 8, 3
10. 8, 10, 9, 3, 7, 4, 4, 5, 6, 7, 6
11. 12, 16, 34, 45, 62, 37, 94, 85
12. 54, 83, 75, 28, 55, 74, 83, 66
13. 145, 267, 384, 426, 987, 851, 912

Add the following by columns and by lines, and check the work by adding the vertical and horizontal totals:

14.	6216	1375	3427	5489	7321
	3297	9824	1938	4786	8040
	4583	6370	2647	3250	3694
	2008	5248	8428	9387	2385
	<u>4679</u>	<u>1367</u>	<u>7091</u>	<u>1666</u>	<u>9289</u>
15.	12,358	8,468	20,971	15,267	5,032
	69,371	23,670	1,367	36,828	6,789
	8,254	54,826	8,473	10,545	25,368
	10,026	3,794	26,845	2,697	82,793
	36,954	8,267	50,732	1,379	54,368
	20,125	10,925	60,115	5,426	7,965
	<u>9,236</u>	<u>36,848</u>	<u>9,365</u>	<u>63,720</u>	<u>8,260</u>

16. Find the cost of the following: sugar, ₦9.25; rice, ₦6.75; coffee, ₦2.85; meat, ₦1.75; butter, ₦1.85; potatoes, ₦5.95.

SUBTRACTION

4. Oral.

Give differences at sight:

- | | | | | | |
|--|---|--|---|---|--|
| 1. $\begin{array}{r} 48 \\ 16 \\ \hline 32 \end{array}$ | 2. $\begin{array}{r} 68 \\ 23 \\ \hline 45 \end{array}$ | 3. $\begin{array}{r} 44 \\ 9 \\ \hline 35 \end{array}$ | 4. $\begin{array}{r} 63 \\ 8 \\ \hline 55 \end{array}$ | 5. $\begin{array}{r} 42 \\ 13 \\ \hline 29 \end{array}$ | 6. $\begin{array}{r} 33 \\ 14 \\ \hline 19 \end{array}$ |
| 7. $\begin{array}{r} 448 \\ 222 \\ \hline 226 \end{array}$ | 8. $\begin{array}{r} 357 \\ 333 \\ \hline 24 \end{array}$ | 9. $\begin{array}{r} 874 \\ 223 \\ \hline 651 \end{array}$ | 10. $\begin{array}{r} 648 \\ 445 \\ \hline 203 \end{array}$ | 11. $\begin{array}{r} 702 \\ 9 \\ \hline 693 \end{array}$ | 12. $\begin{array}{r} 411 \\ 12 \\ \hline 399 \end{array}$ |

For rapid oral drill give dictation exercises.

$$50 - 22 = 50 - 20 - 2 \quad \text{Think } 50 - 20 = 30; 30 - 2 = 28.$$

- | | | | |
|---------------|---------------|---------------|---------------|
| 13. $60 - 31$ | 17. $83 - 15$ | 21. $70 - 19$ | 25. $54 - 26$ |
| 14. $70 - 33$ | 18. $65 - 24$ | 22. $63 - 25$ | 26. $43 - 28$ |
| 15. $80 - 34$ | 19. $52 - 28$ | 23. $45 - 28$ | 27. $67 - 49$ |
| 16. $71 - 22$ | 20. $49 - 13$ | 24. $65 - 36$ | 28. $48 - 28$ |

29. Define *subtraction*; *minuend*; *subtrahend*; *difference*.

5. Written.

- | | |
|--|---|
| 1. $\text{P } 135 - \text{P } 95.75$ | 7. $2045\frac{1}{2} - 976\frac{3}{4}$ |
| 2. $45,000 - 37,126$ | 8. $176,643\frac{1}{2} - 93,624\frac{1}{2}$ |
| 3. $125,000 - 96,733$ | 9. $304,762\frac{1}{2} - 99,285\frac{1}{2}$ |
| 4. $\text{P } 4461.25 - \text{P } 1932.43$ | 10. $800,000 - 637,526$ |
| 5. $\text{P } 23,025.50 - \text{P } 9142.75$ | 11. $\$94,320.44 - \$44,144.85$ |
| 6. $\text{P } 147,000 - \text{P } 53,426.45$ | 12. $\$100,000 - \$75,530.25$ |

13. A man had $\text{P } 1450.50$ in a bank. He drew out $\text{P } 375.75$ at one time, $\text{P } 425.75$ at another time, and $\text{P } 265.35$ at another time. How much money had he still in the bank?

He drew out the sum of $\text{P } 375.75$, $\text{P } 425.75$, and $\text{P } 265.35$, or $\text{P } \underline{\hspace{1cm}}$.He had left the difference between $\text{P } 1450.50$ and $\text{P } \underline{\hspace{1cm}}$, or $\text{P } \underline{\hspace{1cm}}$.

Use 1-12, § 5, for practice in horizontal subtraction.

14. Two boys 4200 meters apart are walking toward each other. When one has walked 1485 meters and the other 1575 meters, how far apart are they?

15. A traveler rode 242 kilometers in four days. If he rode $65\frac{1}{2}$ Km the first day, $62\frac{3}{4}$ Km the second day, and $55\frac{3}{8}$ Km the third day, how far did he ride the fourth day?

16. The areas of the five largest islands in the Philippine group are given in this table. The area of Luzon is how much greater than that of each of the other islands? Find the total area of these five islands.

Luzon . . .	10,610,971 Ha
Mindanao . . .	9,399,628 Ha
Samar . . .	1,303,029 Ha
Negros . . .	1,264,179 Ha
Panay . . .	1,194,249 Ha

17. From the table in No. 16 determine how much the area of Mindanao exceeds the areas of Samar, Negros, and Panay, taken together.

18. This table gives the amount of cocoa and chocolate imported into the United States in the years 1901-1905. Find the increase for each year. Also find the increase of 1905 over 1901, and the total amount imported in these five years.

1901	21,580,524 Kg
1902	23,995,727 Kg
1903	29,505,266 Kg
1904	34,051,090 Kg
1905	35,100,839 Kg

MULTIPLICATION

6. Oral.

- | | | | |
|-----------------------------|--------------------|-----------------------------|------------------------------|
| 1. $3\frac{1}{3} \times 30$ | 5. 8×400 | 9. 42×200 | 13. $8 \times \text{P}2.08$ |
| 2. $4\frac{1}{2} \times 12$ | 6. 3×330 | 10. 80×300 | 14. $10 \times \text{P}4.25$ |
| 3. $8\frac{1}{3} \times 6$ | 7. 20×400 | 11. $3 \times \text{P}1.25$ | 15. $11 \times \text{P}2.02$ |
| 4. $6\frac{1}{4} \times 20$ | 8. 30×333 | 12. $5 \times \text{P}3.12$ | 16. $9 \times \text{P}3.11$ |

17. Define *multiplicand*; *multiplier*; *product*.

18. Define *abstract number*; *concrete number*.

7. Written.*Multiply :*

- | | | | |
|---|--|---|--|
| 1. $\begin{array}{r} 467,063 \\ \underline{2,046} \end{array}$ | 2. $\begin{array}{r} 33,085 \\ \underline{8,004} \end{array}$ | 3. $\begin{array}{r} 28,684 \\ \underline{12,460} \end{array}$ | 4. $\begin{array}{r} 47,050 \\ \underline{64,000} \end{array}$ |
| 5. $\begin{array}{r} \text{P } 4,607.25 \\ \underline{124} \end{array}$ | 6. $\begin{array}{r} \text{P } 8,175.45 \\ \underline{86} \end{array}$ | 7. $\begin{array}{r} \text{P } 437.75 \\ \underline{372} \end{array}$ | 8. $\begin{array}{r} \text{P } 526.35 \\ \underline{4034} \end{array}$ |

9. What will 285 sacks of beans cost at ₱9.75 a sack?
10. At the rate of $62\frac{1}{2}$ kilometers an hour, how far will a train run in 28 hours?
11. A hotel uses $17\frac{1}{2}$ kilos of meat a day. At ₱.95 a kilo, what will be the cost of the meat used in one week?
12. I bought $12\frac{1}{2}$ meters of muslin at ₱.24 a meter, $3\frac{3}{4}$ meters of satin at ₱.90 a meter, and $7\frac{1}{2}$ meters of ribbon at ₱.42 a meter. How much change did I receive from ₱10?
13. If a cubic meter of pressed bricks weighs 2415 kilos, what will be the weight of $27\frac{3}{4}$ cubic meters?
14. A farmer sold during one month 75 chickens at ₱.65 each, 18 dozen eggs at ₱.35 a dozen, 12 turkeys at ₱4.50 each, and 15 ducks at ₱1.10 each. How much did he receive for all?
15. I have a square field 245 meters on a side. At ₱.12 $\frac{1}{2}$ per meter, how much will it cost to build a fence around the field?
16. A has ₱44, B has $2\frac{1}{2}$ times as much as A, and C has 3 times as much as B. How much have they all together?
17. A dealer bought a barrel of oil containing 140 liters at ₱.32 a liter. 12 liters were lost by leakage. He sold 75 liters at ₱.40 a liter and the remainder at ₱.38 a liter. How much did he gain?

DIVISION

8. Oral.

Notice that there are two kinds of division:

(1) Finding one of the equal parts of a number (sometimes called *partition*). $\text{P}250 \div 5 = \text{P}50$. $\text{P}250$ is separated into 5 equal parts.

(2) Finding how many times one number is contained in another number of the same kind (sometimes called *measuring*). $\text{P}250 \div \text{P}50 = 5$. $\text{P}250$ is measured by $\text{P}50$.

Keep in mind this difference when you are analyzing problems in division.

1. If 5 hats cost $\text{P}15$, what will 7 hats cost?

If 5 hats cost $\text{P}15$, 1 hat costs $\frac{1}{5}$ of $\text{P}15$, or $\text{P}3$. 7 hats will cost $7 \times \text{P}3$, or $\text{P}21$.

2. At $\text{P}7$ a cavan, how many cavaness of rice can I buy for $\text{P}147$?

1 cavan of rice costs $\text{P}7$. $\text{P}147$ contains $\text{P}7$, 21 times. Therefore I can buy 21 cavaness for $\text{P}147$.

3. At $\text{P}8$ each, how many coats can I buy for $\text{P}48$?

4. If 12 oranges cost 48 centavos, what will 21 oranges cost?

5. If 3 apples cost 24 centavos, how many apples can I buy for 80 centavos?

6. If 2 meters of cloth cost $\text{P}24$, what will 10 meters cost?

7. Define *division*; *divisor*; *dividend*; *quotient*; *remainder*.

9. Written.

To test the work, multiply together the divisor and quotient and add the remainder. The result should be the dividend.

Find quotients:

1. $2256 \div 6$

5. $39,897 \div 9$

9. $\text{P}668.84 \div 9$

2. $2792 \div 8$

6. $50,000 \div 7$

10. $\text{P}783.40 \div 6$

3. $3745 \div 7$

7. $48,108 \div 9$

11. $\text{P}656.47 \div 7$

4. $8796 \div 6$

8. $71,374 \div 6$

12. $\text{P}892.56 \div 8$

Find quotients and test:

$$24493 \div 46$$

$$\begin{array}{r} 532\overset{11}{48} \\ 46 \overline{)24493} \\ \underline{230} \\ 149 \\ \underline{138} \\ 113 \\ \underline{92} \\ 21 \end{array}$$

$$13. \quad 3915 \div 127$$

$$14. \quad 9291 \div 175$$

$$15. \quad 2856 \div 93$$

$$16. \quad 5856 \div 78$$

$$17. \quad 8448 \div 88$$

$$18. \quad 7350 \div 98$$

$$19. \quad 8135 \div 77$$

$$20. \quad 7307 \div 69$$

$$21. \quad 24,673 \div 208$$

$$22. \quad 65,435 \div 322$$

$$23. \quad 32,868 \div 166$$

$$24. \quad 52,583 \div 442$$

$$25. \quad 85,672 \div 625$$

$$26. \quad 48,300 \div 276$$

$$27. \quad 283,487 \div 375$$

$$28. \quad 472,367 \div 408$$

$$29. \quad 487,043 \div 642$$

$$30. \quad 763,504 \div 564$$

$$31. \quad 605,821 \div 735$$

$$32. \quad 812,563 \div 680$$

$$33. \quad 745,075 \div 582$$

$$34. \quad 1,467,483 \div 1225$$

$$35. \quad 2,856,672 \div 1143$$

$$36. \quad 3,107,439 \div 1405$$

$$37. \quad 4,263,045 \div 2313$$

$$38. \quad 6,403,175 \div 2500$$

39. How many horses at ₱85 each can I buy for ₱10,710?

40. A farmer paid ₱14,875 for 175 hektars of land. How much did he pay per hektar?

41. If a man earns ₱520 in 8 months, how much will he earn in 12 months? Analyze.

42. How many cavanese are there in 10,745 liters?

43. I exchanged 3 carabaos valued at ₱121 each for hemp worth ₱22 a picul. How many piculs of hemp did I get?

44. A man sold 280 goats for ₱4.50 each, and with the money bought sheep at ₱4.00 each. How many sheep did he buy?

45. At the rate of 340 meters per second, how long will it take sound to travel 2550 meters? Analyze.

46. Which costs the more per picul, 64 piculs of sugar for ₱272, or 7 piculs for ₱30.10?

REVIEW PROBLEMS

10. Written.

1. If 28 horses cost ₱3780, what will 36 horses cost at the same rate? Analyze.
2. A man works 6 days a week for 28 weeks at ₱2.75 a day. How much does he earn?
3. Find the cost of 8 cheeses weighing $2\frac{1}{2}$ kilos each, at ₱1.35 a kilo.
4. If 14 men can do a piece of work in 10 days, how long will it take 16 men to do it?
5. At the rate of ₱75 for 12 turkeys, how much must I pay for 5 turkeys? For 22 turkeys? For 50 turkeys?
6. A fruit dealer bought four bunches of bananas containing 396 bananas for ₱.65 a bunch. He sold the bananas for ₱.10 a dozen. How much did he gain?
7. Sailing 370 kilometers a day, how many days would it take a steamer to go from Guam to San Francisco, a distance of 8325 kilometers?
8. A piece of land containing 37,620 square meters is cut into 38 equal lots. How many square meters are there in each lot?
9. A man bought $8\frac{1}{2}$ meters of cloth at ₱.24 a meter, $12\frac{1}{2}$ meters at ₱.25 a meter, and $9\frac{1}{2}$ meters at ₱.50 a meter. How many cavanes of maize at ₱2.22 a cavan will pay for the cloth?
10. How much will it cost to send a cable message of 27 words from Manila to New York at ₱2.24 a word?
11. The product of two numbers is 173,696. One of the numbers is 368; what is the other number?
12. Two men are 47 kilometers apart. If they travel away from each other, one 75 Km a day and the other 54 Km a day, how far apart will they be at the end of the second day?

13. From a piece of cloth containing $45\frac{3}{4}$ meters, $12\frac{1}{2}$ meters, $16\frac{3}{4}$ meters, and $9\frac{1}{2}$ meters were sold. How many meters were left?

14. A farmer sold 75 piculs of hemp at ₱ 20 a picul and 400 cavanese of maize at ₱ 2.25 a cavan. With the money he bought land at ₱ 125 a hektar. How many hektars did he buy?

15. A dealer bought 50 bicycles at ₱ 75 each. He paid ₱ 450 duty, and ₱ 175 freight. For how much must he sell each bicycle in order to gain ₱ 500 on the whole lot?

16. Find the cost of 18 baseballs at ₱ 32 a dozen; 7 gloves at ₱ 3.60 each; 2 mits at ₱ 12.75 each; and 4 bats at ₱ 1.35 each.

17. With ₱ 4.00 I wish to buy 10-centavo, 4-centavo, and 2-centavo stamps so that I shall have the same number of each. How many of each kind shall I get?

18. A farmer has a coconut grove of $6\frac{1}{2}$ hektars, with 110 trees to the hektar. If each tree yields 80 nuts a year, what will be the value of the crop at ₱ 22 a thousand?

19. A fruit dealer buys 8 boxes of lemons at ₱ 5.75 a box. There are 140 lemons in each box. If he sells them at ₱ .60 a dozen, how much will he gain?

20. A boy bought 300 oranges at the rate of 2 for 3 centavos and sold them at the rate of 2 for 5 centavos. How much did he gain?

21. How many meters of sinamay at ₱ .24 a meter will pay for 96 gantas of rice worth ₱ .20 a ganta? Analyze.

22. A lady paid ₱ 5.10 for 6 meters of satin. At that rate, how many meters can she buy for ₱ 29.75? Analyze.

23. A boy deposited in the Postal Savings Bank ₱ 4.25 each month for a year. If during that time he drew out ₱ 6.25, ₱ 3.50, ₱ 4.75, and ₱ 2.50, how much had he still in the bank?



11. Written.

The gutta-percha tree, from the sap of which the gutta-percha of commerce is made, is found in several of the Philippine Islands. If care is taken to collect the sap without destroying the tree, the gathering of gutta-percha promises to become an important industry.

1. 169,696 Kg of gutta-percha were taken from the public lands of the Philippines during 1902, and 277,078 Kg during 1903. Find the increase in the amount taken.

2. In one year 6,964 Kg of gutta-percha were obtained in Cottabato, 214 Kg in Jolo, and 15,938 Kg in Zamboanga. Find the total amount taken.

3. In 1847 it was discovered that gutta-percha made the best covering for telegraphic cables. How long has it been used for this purpose?

4. A Chinese exporter bought 73 piculs of gutta-percha at ₱42.50 per picul. After paying ₱6.35 per picul forestry tax, he sold the gutta-percha for ₱98.50 per picul. What was his profit?

5. The United States imported 280,560 pounds of gutta-percha valued at \$130,957 in 1901; 525,767 pounds valued at \$252,329 in 1902; 316,290 pounds valued at \$222,400 in 1903; 424,617 pounds valued at \$174,953 in 1904; 665,217 pounds valued at \$210,118 in 1905. Find the amount imported and the total value.

FACTORS AND MULTIPLES

FACTORS

12. Oral.

The **factors** of a number are the whole numbers which multiplied together produce the number. 2, 3, and 5 are the factors of 30.

Any exact divisor of a number is a factor of it.

A **prime number** has no factors except itself and 1; as 5, 17.

A **composite number** has other factors than itself and 1; as 6.

Factoring is the process of separating a number into its factors.

1. What is a prime factor? An even number? An odd number?

2. Name all of the prime numbers between 1 and 100.

3. Give the prime factors of: 14, 15, 20, 21, 28, 30, 27, 18, 32, 40, 45, 36, 42, 48, 55, 60, 66, 70, 72, 75, 80, 84, 90, 100.

A number is divisible:

By 2, if it ends in 2, 4, 6, 8, or 0; as 24, 70.

By 5, if it ends in 0, or 5; as 25, 40.

By 3, if the sum of its digits is divisible by 3; as 72, 182.

4. Give six numbers greater than 300 that are divisible by 2; by 3; by 5.

13. Written.

Find the prime factors of 420.

<div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">2</div> <div style="border-left: 1px solid black; padding-left: 5px;">420</div> </div> <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">2</div> <div style="border-left: 1px solid black; padding-left: 5px;">210</div> </div> <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">5</div> <div style="border-left: 1px solid black; padding-left: 5px;">105</div> </div> <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">3</div> <div style="border-left: 1px solid black; padding-left: 5px;">21</div> </div> <div style="margin-top: 5px; text-align: center;">7</div>	<p>The prime factors of 420 are 2, 2, 5, 3, and 7. $2 \times 2 \times 5 \times 3 \times 7 = 420$.</p> <p>If any number is not divisible by 2, 3, or 5, try in order the prime numbers 7, 11, 13, 17, etc., as divisors until you obtain a quotient no larger than the divisor used. If none of these divisors divides the number exactly, it is a prime number.</p>
--	--

Find the prime factors of the following:

- | | | | | |
|--------|---------|----------|----------|----------|
| 1. 124 | 6. 550 | 11. 756 | 16. 1296 | 21. 3360 |
| 2. 160 | 7. 600 | 12. 363 | 17. 2200 | 22. 1664 |
| 3. 250 | 8. 750 | 13. 2255 | 18. 2600 | 23. 2550 |
| 4. 330 | 9. 385 | 14. 1485 | 19. 1980 | 24. 3675 |
| 5. 480 | 10. 640 | 15. 4032 | 20. 4235 | 25. 3400 |

14. Oral.

A **common factor** of two or more numbers is a factor that is contained in each of them. 7 is a common factor of 21 and 35.

The **greatest common factor** (G. C. F.) of two or more numbers is the greatest factor contained in each of them. 12 is the greatest common factor of 24, 36, and 48.

Numbers that have no common factors are said to be **prime** to each other. 21 and 32 are prime to each other.

Name the G. C. F. in each of the following sets of numbers:

- | | | | |
|-----------|---------------|---------------|---------------------|
| 1. 20, 40 | 4. 12, 18, 24 | 7. 24, 40, 48 | 10. 16, 32, 40, 48 |
| 2. 16, 24 | 5. 21, 35, 63 | 8. 15, 30, 45 | 11. 20, 40, 50, 60 |
| 3. 20, 50 | 6. 22, 33, 44 | 9. 30, 60, 90 | 12. 30, 60, 90, 120 |

15. Written.

What is the G. C. F. of 42, 63, and 105?

$42 = 3 \times 7 \times 2$ Separate the numbers into their prime factors. The
 $63 = 3 \times 7 \times 3$ factors, 3 and 7, are common to all of the numbers
 $105 = 3 \times 7 \times 5$ Their product, 3×7 , or 21, is the G. C. F.

Find the G. C. F. of:

- | | | |
|----------------|------------------|-----------------------|
| 1. 33, 66, 121 | 6. 64, 128, 320 | 11. 72, 180, 252 |
| 2. 36, 72, 144 | 7. 70, 105, 280 | 12. 125, 225, 275 |
| 3. 48, 96, 120 | 8. 64, 160, 192 | 13. 28, 56, 70, 98 |
| 4. 63, 90, 117 | 9. 84, 140, 168 | 14. 32, 48, 64, 128 |
| 5. 39, 78, 117 | 10. 99, 165, 198 | 15. 54, 135, 162, 189 |

MULTIPLES**16. Oral.**

A **multiple** of a number is another number that exactly contains it. 12, 18, and 42 are multiples of 6.

A **common multiple** of two or more numbers is a number that exactly contains each of them. 84 is a common multiple of 2 and 7.

The **least common multiple** (L. C. M.) of two or more numbers is the smallest number that exactly contains each of them. 14 is the L. C. M. of 2 and 7.

Name the L. C. M. of:

- | | | | |
|------------|--------------|-----------------|------------------|
| 1. 4 and 5 | 4. 8 and 9 | 7. 2, 3, and 4 | 10. 4, 6, and 10 |
| 2. 5 and 8 | 5. 10 and 15 | 8. 2, 6, and 8 | 11. 4, 8, and 16 |
| 3. 9 and 4 | 6. 12 and 8 | 9. 6, 9, and 12 | 12. 3, 9, and 10 |

17. Written.

Find the L. C. M. of 24, 30, and 80.

$$24 = 2 \times 2 \times 2 \times 3$$

$$30 = 2 \times 3 \times 5$$

$$80 = 2 \times 2 \times 2 \times 2 \times 5$$

$$2 \times 2 \times 2 \times 2 \times 3 \times 5 = 240, \text{ L. C. M.}$$

A multiple of 24, 30, and 80 contains all the factors of each number.

Therefore, to find the L. C. M. of 24, 30, and 80, we take the product of all the different prime factors, using each the greatest number of times it occurs in any one number.

Find the L. C. M. of:

- | | | |
|-----------------|-----------------|------------------------|
| 1. 30, 40, 60 | 7. 42, 35, 140 | 13. 150, 180, 270, 330 |
| 2. 20, 30, 80 | 8. 72, 18, 108 | 14. 88, 220, 242, 352 |
| 3. 22, 33, 99 | 9. 36, 84, 168 | 15. 25, 50, 125, 250 |
| 4. 25, 75, 225 | 10. 180, 96, 60 | 16. 24, 36, 72, 144 |
| 5. 45, 90, 135 | 11. 80, 200, 64 | 17. 160, 224, 288, 320 |
| 6. 220, 24, 300 | 12. 56, 90, 288 | 18. 180, 270, 405, 450 |

18. Written.

CANCELATION

Rejecting equal factors from both dividend and divisor in division is called **cancellation**.

Divide 8×9 by 4×3 .

$$\frac{2 \quad 3}{\cancel{8} \times \cancel{9}} = 6$$

Divide $12 \times 7 \times 5$ by $15 \times 3 \times 7$.

$$\frac{\overset{4}{\cancel{12}} \times \cancel{7} \times \cancel{5}}{\cancel{15} \times \cancel{3} \times \cancel{7}} = \frac{4}{3} = 1\frac{1}{3}$$

Divide:

- | | | |
|---|--|--|
| 1. 36×24 by 12×48 | 4. 27×32 by 36×48 | |
| 2. 75×40 by 60×25 | 5. 70×35 by 50×14 | |
| 3. 64×77 by 32×55 | 6. $44 \times 36 \times 5$ by $24 \times 11 \times 12$ | |
| 7. $\frac{4 \times 28 \times 9}{16 \times 14 \times 18}$ | 14. $\frac{36 \times 35 \times 6}{28 \times 45 \times 9}$ | 21. $\frac{33 \times 8 \times 9 \times 75}{12 \times 25 \times 22}$ |
| 8. $\frac{5 \times 33 \times 27}{11 \times 30 \times 18}$ | 15. $\frac{27 \times 44 \times 10}{60 \times 77 \times 18}$ | 22. $\frac{120 \times 32 \times 25 \times 14}{48 \times 40 \times 70}$ |
| 9. $\frac{8 \times 20 \times 18}{60 \times 16 \times 5}$ | 16. $\frac{54 \times 40 \times 33}{60 \times 27 \times 44}$ | 23. $\frac{108 \times 26 \times 20 \times 11}{36 \times 16 \times 22 \times 39}$ |
| 10. $\frac{13 \times 27 \times 25}{39 \times 45 \times 7}$ | 17. $\frac{63 \times 70 \times 50}{75 \times 35 \times 42}$ | 24. $\frac{65 \times 121 \times 63 \times 30}{55 \times 13 \times 81 \times 77}$ |
| 11. $\frac{33 \times 25 \times 16}{55 \times 45 \times 32}$ | 18. $\frac{8 \times 81 \times 32}{9 \times 45 \times 64}$ | 25. $\frac{56 \times 77 \times 84 \times 40}{49 \times 48 \times 21 \times 110}$ |
| 12. $\frac{50 \times 26 \times 90}{20 \times 13 \times 75}$ | 19. $\frac{27 \times 35 \times 24}{9 \times 21 \times 45}$ | 26. $\frac{125 \times 65 \times 63 \times 5}{39 \times 75 \times 25 \times 105}$ |
| 13. $\frac{25 \times 24 \times 16}{10 \times 20 \times 11}$ | 20. $\frac{100 \times 84 \times 27}{48 \times 14 \times 75}$ | 27. $\frac{200 \times 11 \times 140 \times 93}{80 \times 62 \times 77 \times 150}$ |

28. At ₦45 per 100 liters, what will 25,300 liters of alcohol cost?

29. I paid ₦2025 for 30 lots of 270 sq. m each. What did I pay per sq. m?

30. At ₦1.44 per dozen, how many loaves of bread will ₦18.72 purchase?

FRACTIONS

19. Oral.

A fraction is one or more of the equal parts of a unit.

The numerator and denominator are the terms of the fraction.

1. What does the denominator show? The numerator?

$\frac{1}{3}, \frac{2}{5}, \frac{3}{7}, \frac{1}{12}, \frac{9}{20}$ are proper fractions.

$\frac{3}{2}, \frac{8}{5}, \frac{9}{7}, \frac{15}{12}, \frac{27}{2}$ are improper fractions.

$3\frac{1}{2}, 5\frac{1}{3}, 7\frac{2}{5}, 8\frac{3}{4}, 12\frac{7}{10}$ are mixed numbers.

2. Define *proper fraction*; *improper fraction*; *mixed number*.

REDUCTION OF FRACTIONS TO HIGHER OR LOWER TERMS

20. Oral.

Multiplying or dividing both terms of a fraction by the same number does not change its value.

A fraction is in its **lowest terms** when its numerator and denominator are prime to each other.

To reduce a fraction to lowest terms, cancel all the factors common to both of its terms.

Reduce to lowest terms:

1. $\frac{6}{9}, \frac{12}{15}, \frac{9}{12}, \frac{10}{18}, \frac{15}{20}, \frac{12}{18}, \frac{15}{25}$

4. $\frac{10}{50}, \frac{20}{50}, \frac{21}{35}, \frac{18}{36}, \frac{25}{40}, \frac{20}{80}, \frac{25}{50}$

2. $\frac{14}{21}, \frac{12}{24}, \frac{9}{15}, \frac{8}{20}, \frac{20}{25}, \frac{10}{35}, \frac{16}{24}$

5. $\frac{27}{45}, \frac{30}{40}, \frac{50}{80}, \frac{18}{45}, \frac{33}{44}, \frac{24}{36}, \frac{44}{55}$

3. $\frac{4}{20}, \frac{18}{24}, \frac{11}{22}, \frac{11}{20}, \frac{22}{33}, \frac{4}{14}, \frac{9}{21}$

6. $\frac{20}{90}, \frac{25}{75}, \frac{22}{66}, \frac{9}{63}, \frac{5}{60}, \frac{15}{60}, \frac{14}{49}$

21. Written.

Reduce to lowest terms:

1. $\frac{21}{84}$

5. $\frac{77}{132}$

9. $\frac{125}{800}$

13. $\frac{108}{216}$

17. $\frac{680}{785}$

2. $\frac{120}{132}$

6. $\frac{26}{480}$

10. $\frac{125}{375}$

14. $\frac{504}{616}$

18. $\frac{875}{1000}$

3. $\frac{25}{275}$

7. $\frac{63}{140}$

11. $\frac{168}{248}$

15. $\frac{260}{880}$

19. $\frac{125}{1000}$

4. $\frac{85}{105}$

8. $\frac{140}{217}$

12. $\frac{35}{175}$

16. $\frac{168}{336}$

20. $\frac{375}{1000}$

22. Oral.

Change $\frac{4}{5}$ to 25ths.

Multiply both terms of the fraction by 5 to make the denominator 25.

$$\frac{4 \times 5}{5 \times 5} = \frac{20}{25}$$

Change:

1. $\frac{1}{8}, \frac{1}{4}, \frac{2}{8}, \frac{3}{8}, \frac{4}{8}, \frac{5}{12}$, to 24ths.
2. $\frac{1}{8}, \frac{1}{6}, \frac{2}{8}, \frac{2}{6}, \frac{3}{8}, \frac{4}{6}$, to 15ths.
3. $\frac{1}{2}, \frac{1}{6}, \frac{2}{6}, \frac{4}{6}, \frac{3}{10}, \frac{7}{10}$, to 20ths.
4. $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{3}{8}, \frac{5}{8}, \frac{7}{8}$, to 16ths.
5. $\frac{2}{3}, \frac{3}{4}, \frac{5}{6}, \frac{3}{8}, \frac{5}{8}, \frac{5}{12}$, to 24ths.
6. $\frac{1}{3}, \frac{2}{3}, \frac{1}{5}, \frac{3}{5}, \frac{1}{6}, \frac{5}{6}$, to 30ths.
7. How do you change a fraction to higher terms?

23. Written.

Change:

1. $\frac{4}{5}, \frac{3}{10}, \frac{2}{25}, \frac{7}{25}, \frac{21}{25}$, to 50ths.
2. $\frac{2}{3}, \frac{4}{5}, \frac{4}{15}, \frac{7}{10}, \frac{11}{10}$, to 60ths.
3. $\frac{5}{6}, \frac{3}{8}, \frac{5}{18}, \frac{3}{24}, \frac{7}{24}$, to 48ths.
4. $\frac{2}{3}, \frac{2}{5}, \frac{4}{5}, \frac{7}{25}, \frac{13}{25}$, to 75ths.
5. $\frac{3}{4}, \frac{5}{6}, \frac{7}{18}, \frac{13}{18}, \frac{21}{10}$, to 80ths.
6. $\frac{1}{2}, \frac{3}{4}, \frac{5}{8}, \frac{3}{16}, \frac{7}{32}$, to 64ths.

REDUCTION OF WHOLE OR MIXED NUMBERS TO IMPROPER FRACTIONS

24. Oral.

1. How many halves are there in 1? In 2? In $2\frac{1}{2}$? In $4\frac{1}{2}$?
2. How many thirds are there in 1? In 2? In $2\frac{1}{3}$? In $4\frac{2}{3}$?
3. How many tenths are there in 1? In 3? In $3\frac{3}{10}$? In $4\frac{7}{10}$?

Change to improper fractions:

4. $4\frac{1}{2}$ $4\frac{2}{3}$ $3\frac{5}{6}$ $2\frac{5}{6}$ $3\frac{3}{4}$ $4\frac{4}{5}$ $4\frac{5}{6}$ $6\frac{2}{3}$ $8\frac{3}{4}$ $11\frac{1}{2}$
5. $6\frac{2}{3}$ $9\frac{4}{5}$ $8\frac{5}{6}$ $4\frac{5}{11}$ $7\frac{5}{6}$ $8\frac{7}{10}$ $11\frac{3}{8}$ $20\frac{3}{4}$ $12\frac{1}{2}$ $30\frac{3}{8}$
6. $33\frac{1}{3}$ $40\frac{1}{3}$ $21\frac{2}{3}$ $50\frac{2}{3}$ $31\frac{2}{3}$ $20\frac{7}{8}$ $41\frac{1}{2}$ $12\frac{7}{10}$ $101\frac{1}{2}$ $4\frac{7}{12}$
7. $2\frac{4}{15}$ $2\frac{3}{16}$ $10\frac{3}{14}$ $9\frac{5}{12}$ $12\frac{3}{8}$ $20\frac{5}{6}$ $31\frac{4}{5}$ $22\frac{3}{4}$ $30\frac{5}{6}$ $3\frac{4}{7}$

Review sections 23 and 24 for rapid drill.

25. Written.

Change $16\frac{5}{8}$ to an improper fraction.

$$1 = \frac{8}{8} \quad 16 = 16 \times \frac{8}{8} = \frac{128}{8} \quad \frac{128}{8} + \frac{5}{8} = \frac{133}{8}$$

1. How do you change a mixed number to an improper fraction?

Change to improper fractions:

- | | | | | |
|--------------------|---------------------|----------------------|----------------------|----------------------|
| 2. $21\frac{1}{5}$ | 6. $62\frac{2}{3}$ | 10. $81\frac{3}{4}$ | 14. $30\frac{1}{8}$ | 18. $110\frac{3}{8}$ |
| 3. $25\frac{5}{8}$ | 7. $20\frac{5}{8}$ | 11. $60\frac{4}{9}$ | 15. $41\frac{1}{9}$ | 19. $207\frac{1}{3}$ |
| 4. $31\frac{3}{7}$ | 8. $21\frac{5}{12}$ | 12. $107\frac{3}{8}$ | 16. $123\frac{3}{8}$ | 20. $107\frac{3}{8}$ |
| 5. $25\frac{4}{5}$ | 9. $105\frac{3}{5}$ | 13. $50\frac{6}{8}$ | 17. $82\frac{3}{4}$ | 21. $90\frac{4}{5}$ |

REDUCTION OF IMPROPER FRACTIONS TO WHOLE OR MIXED NUMBERS

26. Oral.

Change to whole or mixed numbers:

- | | | | | | | | | | |
|-------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|---------------------|--------------------|--------------------|
| 1. $\frac{13}{8}$ | 14. $\frac{14}{4}$ | 17. $\frac{17}{5}$ | 19. $\frac{19}{8}$ | 20. $\frac{20}{9}$ | 25. $\frac{25}{6}$ | 26. $\frac{26}{7}$ | 27. $\frac{27}{12}$ | 28. $\frac{28}{5}$ | 29. $\frac{29}{6}$ |
| 2. $\frac{37}{6}$ | 15. $\frac{15}{7}$ | 18. $\frac{18}{4}$ | 21. $\frac{21}{9}$ | 24. $\frac{24}{3}$ | 27. $\frac{27}{8}$ | 30. $\frac{30}{9}$ | 33. $\frac{33}{7}$ | 36. $\frac{36}{6}$ | 39. $\frac{39}{4}$ |
| 3. $\frac{43}{8}$ | 16. $\frac{16}{7}$ | 19. $\frac{19}{4}$ | 22. $\frac{22}{6}$ | 25. $\frac{25}{8}$ | 28. $\frac{28}{5}$ | 31. $\frac{31}{9}$ | 34. $\frac{34}{7}$ | 37. $\frac{37}{8}$ | 40. $\frac{40}{8}$ |

27. Written.

Change $\frac{125}{14}$ to a mixed number. $\frac{14}{14} = 1$
 $\frac{125}{14} + \frac{14}{14} = 125 + 14 = 81\frac{11}{14}$

1. How do you change an improper fraction to a whole or mixed number?

Change to whole or mixed numbers:

- | | | | | | |
|---------------------|---------------------|----------------------|----------------------|----------------------|----------------------|
| 2. $\frac{27}{15}$ | 6. $\frac{235}{25}$ | 10. $\frac{272}{11}$ | 14. $\frac{423}{12}$ | 18. $\frac{521}{8}$ | 22. $\frac{608}{9}$ |
| 3. $\frac{125}{12}$ | 7. $\frac{142}{21}$ | 11. $\frac{292}{15}$ | 15. $\frac{473}{40}$ | 19. $\frac{564}{11}$ | 23. $\frac{622}{40}$ |
| 4. $\frac{75}{14}$ | 8. $\frac{163}{15}$ | 12. $\frac{304}{18}$ | 16. $\frac{463}{18}$ | 20. $\frac{474}{16}$ | 24. $\frac{535}{24}$ |
| 5. $\frac{25}{22}$ | 9. $\frac{137}{18}$ | 13. $\frac{321}{24}$ | 17. $\frac{472}{9}$ | 21. $\frac{523}{21}$ | 25. $\frac{767}{60}$ |

LEAST COMMON DENOMINATOR

28. Written.

We call fractions which have the same denominator **like fractions**, or **similar fractions**, and their denominator, a **common denominator**. $\frac{3}{16}$, $\frac{5}{16}$, and $\frac{8}{16}$ are similar fractions.

The least common multiple of the denominators is the **least common denominator** (L. C. D.) of the fractions.

Change to fractions having the L. C. D.:

- | | | | | |
|--------------------|--------------------|----------------------|----------------------|----------------------|
| 1. $\frac{2}{3}$ | 6. $\frac{1}{12}$ | 11. $\frac{5}{9}$ | 16. $\frac{3}{10}$ | 21. $\frac{2}{5}$ |
| 2. $\frac{1}{4}$ | 7. $\frac{3}{8}$ | 12. $\frac{4}{9}$ | 17. $\frac{2}{3}$ | 22. $\frac{3}{5}$ |
| 3. $\frac{5}{6}$ | 8. $\frac{1}{6}$ | 13. $\frac{7}{8}$ | 18. $\frac{4}{5}$ | 23. $\frac{1}{2}$ |
| 4. $\frac{3}{8}$ | 9. $\frac{2}{3}$ | 14. $\frac{8}{12}$ | 19. $\frac{3}{8}$ | 24. $\frac{5}{15}$ |
| 5. $\frac{2}{7}$ | 10. $\frac{1}{5}$ | 15. $\frac{5}{16}$ | 20. $\frac{4}{15}$ | 25. $\frac{6}{20}$ |
| 6. $\frac{2}{7}$ | 11. $\frac{1}{2}$ | 16. $\frac{5}{18}$ | 21. $\frac{7}{10}$ | 26. $\frac{3}{21}$ |
| 7. $\frac{3}{8}$ | 12. $\frac{2}{3}$ | 17. $\frac{7}{18}$ | 22. $\frac{4}{15}$ | 27. $\frac{5}{35}$ |
| 8. $\frac{2}{7}$ | 13. $\frac{1}{3}$ | 18. $\frac{3}{8}$ | 23. $\frac{5}{16}$ | 28. $\frac{2}{70}$ |
| 9. $\frac{1}{4}$ | 14. $\frac{1}{2}$ | 19. $\frac{2}{10}$ | 24. $\frac{6}{45}$ | 29. $\frac{7}{40}$ |
| 10. $\frac{5}{9}$ | 15. $\frac{2}{3}$ | 20. $\frac{3}{10}$ | 25. $\frac{4}{45}$ | 30. $\frac{1}{2}$ |
| 11. $\frac{3}{8}$ | 16. $\frac{1}{3}$ | 21. $\frac{4}{15}$ | 26. $\frac{5}{45}$ | 31. $\frac{2}{45}$ |
| 12. $\frac{1}{12}$ | 17. $\frac{2}{3}$ | 22. $\frac{5}{15}$ | 27. $\frac{6}{45}$ | 32. $\frac{3}{45}$ |
| 13. $\frac{2}{3}$ | 18. $\frac{1}{3}$ | 23. $\frac{4}{15}$ | 28. $\frac{7}{45}$ | 33. $\frac{4}{45}$ |
| 14. $\frac{1}{4}$ | 19. $\frac{2}{3}$ | 24. $\frac{5}{15}$ | 29. $\frac{8}{45}$ | 34. $\frac{5}{45}$ |
| 15. $\frac{5}{9}$ | 20. $\frac{1}{3}$ | 25. $\frac{6}{15}$ | 30. $\frac{7}{45}$ | 35. $\frac{8}{45}$ |
| 16. $\frac{2}{7}$ | 21. $\frac{2}{3}$ | 26. $\frac{7}{15}$ | 31. $\frac{8}{45}$ | 36. $\frac{9}{45}$ |
| 17. $\frac{3}{8}$ | 22. $\frac{1}{3}$ | 27. $\frac{8}{15}$ | 32. $\frac{9}{45}$ | 37. $\frac{10}{45}$ |
| 18. $\frac{1}{4}$ | 23. $\frac{2}{3}$ | 28. $\frac{9}{15}$ | 33. $\frac{10}{45}$ | 38. $\frac{11}{45}$ |
| 19. $\frac{5}{9}$ | 24. $\frac{1}{3}$ | 29. $\frac{10}{15}$ | 34. $\frac{11}{45}$ | 39. $\frac{12}{45}$ |
| 20. $\frac{2}{7}$ | 25. $\frac{2}{3}$ | 30. $\frac{11}{15}$ | 35. $\frac{12}{45}$ | 40. $\frac{13}{45}$ |
| 21. $\frac{3}{8}$ | 26. $\frac{1}{3}$ | 31. $\frac{12}{15}$ | 36. $\frac{13}{45}$ | 41. $\frac{14}{45}$ |
| 22. $\frac{1}{4}$ | 27. $\frac{2}{3}$ | 32. $\frac{13}{15}$ | 37. $\frac{14}{45}$ | 42. $\frac{15}{45}$ |
| 23. $\frac{5}{9}$ | 28. $\frac{1}{3}$ | 33. $\frac{14}{15}$ | 38. $\frac{15}{45}$ | 43. $\frac{16}{45}$ |
| 24. $\frac{2}{7}$ | 29. $\frac{2}{3}$ | 34. $\frac{15}{15}$ | 39. $\frac{16}{45}$ | 44. $\frac{17}{45}$ |
| 25. $\frac{3}{8}$ | 30. $\frac{1}{3}$ | 35. $\frac{16}{15}$ | 40. $\frac{17}{45}$ | 45. $\frac{18}{45}$ |
| 26. $\frac{1}{4}$ | 31. $\frac{2}{3}$ | 36. $\frac{17}{15}$ | 41. $\frac{18}{45}$ | 46. $\frac{19}{45}$ |
| 27. $\frac{5}{9}$ | 32. $\frac{1}{3}$ | 37. $\frac{18}{15}$ | 42. $\frac{19}{45}$ | 47. $\frac{20}{45}$ |
| 28. $\frac{2}{7}$ | 33. $\frac{2}{3}$ | 38. $\frac{19}{15}$ | 43. $\frac{20}{45}$ | 48. $\frac{21}{45}$ |
| 29. $\frac{3}{8}$ | 34. $\frac{1}{3}$ | 39. $\frac{20}{15}$ | 44. $\frac{21}{45}$ | 49. $\frac{22}{45}$ |
| 30. $\frac{1}{4}$ | 35. $\frac{2}{3}$ | 40. $\frac{21}{15}$ | 45. $\frac{22}{45}$ | 50. $\frac{23}{45}$ |
| 31. $\frac{5}{9}$ | 36. $\frac{1}{3}$ | 41. $\frac{22}{15}$ | 46. $\frac{23}{45}$ | 51. $\frac{24}{45}$ |
| 32. $\frac{2}{7}$ | 37. $\frac{2}{3}$ | 42. $\frac{23}{15}$ | 47. $\frac{24}{45}$ | 52. $\frac{25}{45}$ |
| 33. $\frac{3}{8}$ | 38. $\frac{1}{3}$ | 43. $\frac{24}{15}$ | 48. $\frac{25}{45}$ | 53. $\frac{26}{45}$ |
| 34. $\frac{1}{4}$ | 39. $\frac{2}{3}$ | 44. $\frac{25}{15}$ | 49. $\frac{26}{45}$ | 54. $\frac{27}{45}$ |
| 35. $\frac{5}{9}$ | 40. $\frac{1}{3}$ | 45. $\frac{26}{15}$ | 50. $\frac{27}{45}$ | 55. $\frac{28}{45}$ |
| 36. $\frac{2}{7}$ | 41. $\frac{2}{3}$ | 46. $\frac{27}{15}$ | 51. $\frac{28}{45}$ | 56. $\frac{29}{45}$ |
| 37. $\frac{3}{8}$ | 42. $\frac{1}{3}$ | 47. $\frac{28}{15}$ | 52. $\frac{29}{45}$ | 57. $\frac{30}{45}$ |
| 38. $\frac{1}{4}$ | 43. $\frac{2}{3}$ | 48. $\frac{29}{15}$ | 53. $\frac{30}{45}$ | 58. $\frac{31}{45}$ |
| 39. $\frac{5}{9}$ | 44. $\frac{1}{3}$ | 49. $\frac{30}{15}$ | 54. $\frac{31}{45}$ | 59. $\frac{32}{45}$ |
| 40. $\frac{2}{7}$ | 45. $\frac{2}{3}$ | 50. $\frac{31}{15}$ | 55. $\frac{32}{45}$ | 60. $\frac{33}{45}$ |
| 41. $\frac{3}{8}$ | 46. $\frac{1}{3}$ | 51. $\frac{32}{15}$ | 56. $\frac{33}{45}$ | 61. $\frac{34}{45}$ |
| 42. $\frac{1}{4}$ | 47. $\frac{2}{3}$ | 52. $\frac{33}{15}$ | 57. $\frac{34}{45}$ | 62. $\frac{35}{45}$ |
| 43. $\frac{5}{9}$ | 48. $\frac{1}{3}$ | 53. $\frac{34}{15}$ | 58. $\frac{35}{45}$ | 63. $\frac{36}{45}$ |
| 44. $\frac{2}{7}$ | 49. $\frac{2}{3}$ | 54. $\frac{35}{15}$ | 59. $\frac{36}{45}$ | 64. $\frac{37}{45}$ |
| 45. $\frac{3}{8}$ | 50. $\frac{1}{3}$ | 55. $\frac{36}{15}$ | 60. $\frac{37}{45}$ | 65. $\frac{38}{45}$ |
| 46. $\frac{1}{4}$ | 51. $\frac{2}{3}$ | 56. $\frac{37}{15}$ | 61. $\frac{38}{45}$ | 66. $\frac{39}{45}$ |
| 47. $\frac{5}{9}$ | 52. $\frac{1}{3}$ | 57. $\frac{38}{15}$ | 62. $\frac{39}{45}$ | 67. $\frac{40}{45}$ |
| 48. $\frac{2}{7}$ | 53. $\frac{2}{3}$ | 58. $\frac{39}{15}$ | 63. $\frac{40}{45}$ | 68. $\frac{41}{45}$ |
| 49. $\frac{3}{8}$ | 54. $\frac{1}{3}$ | 59. $\frac{40}{15}$ | 64. $\frac{41}{45}$ | 69. $\frac{42}{45}$ |
| 50. $\frac{1}{4}$ | 55. $\frac{2}{3}$ | 60. $\frac{41}{15}$ | 65. $\frac{42}{45}$ | 70. $\frac{43}{45}$ |
| 51. $\frac{5}{9}$ | 56. $\frac{1}{3}$ | 61. $\frac{42}{15}$ | 66. $\frac{43}{45}$ | 71. $\frac{44}{45}$ |
| 52. $\frac{2}{7}$ | 57. $\frac{2}{3}$ | 62. $\frac{43}{15}$ | 67. $\frac{44}{45}$ | 72. $\frac{45}{45}$ |
| 53. $\frac{3}{8}$ | 58. $\frac{1}{3}$ | 63. $\frac{44}{15}$ | 68. $\frac{45}{45}$ | 73. $\frac{46}{45}$ |
| 54. $\frac{1}{4}$ | 59. $\frac{2}{3}$ | 64. $\frac{45}{15}$ | 69. $\frac{46}{45}$ | 74. $\frac{47}{45}$ |
| 55. $\frac{5}{9}$ | 60. $\frac{1}{3}$ | 65. $\frac{46}{15}$ | 70. $\frac{47}{45}$ | 75. $\frac{48}{45}$ |
| 56. $\frac{2}{7}$ | 61. $\frac{2}{3}$ | 66. $\frac{47}{15}$ | 71. $\frac{48}{45}$ | 76. $\frac{49}{45}$ |
| 57. $\frac{3}{8}$ | 62. $\frac{1}{3}$ | 67. $\frac{48}{15}$ | 72. $\frac{49}{45}$ | 77. $\frac{50}{45}$ |
| 58. $\frac{1}{4}$ | 63. $\frac{2}{3}$ | 68. $\frac{49}{15}$ | 73. $\frac{50}{45}$ | 78. $\frac{51}{45}$ |
| 59. $\frac{5}{9}$ | 64. $\frac{1}{3}$ | 69. $\frac{50}{15}$ | 74. $\frac{51}{45}$ | 79. $\frac{52}{45}$ |
| 60. $\frac{2}{7}$ | 65. $\frac{2}{3}$ | 70. $\frac{51}{15}$ | 75. $\frac{52}{45}$ | 80. $\frac{53}{45}$ |
| 61. $\frac{3}{8}$ | 66. $\frac{1}{3}$ | 71. $\frac{52}{15}$ | 76. $\frac{53}{45}$ | 81. $\frac{54}{45}$ |
| 62. $\frac{1}{4}$ | 67. $\frac{2}{3}$ | 72. $\frac{53}{15}$ | 77. $\frac{54}{45}$ | 82. $\frac{55}{45}$ |
| 63. $\frac{5}{9}$ | 68. $\frac{1}{3}$ | 73. $\frac{54}{15}$ | 78. $\frac{55}{45}$ | 83. $\frac{56}{45}$ |
| 64. $\frac{2}{7}$ | 69. $\frac{2}{3}$ | 74. $\frac{55}{15}$ | 79. $\frac{56}{45}$ | 84. $\frac{57}{45}$ |
| 65. $\frac{3}{8}$ | 70. $\frac{1}{3}$ | 75. $\frac{56}{15}$ | 80. $\frac{57}{45}$ | 85. $\frac{58}{45}$ |
| 66. $\frac{1}{4}$ | 71. $\frac{2}{3}$ | 76. $\frac{57}{15}$ | 81. $\frac{58}{45}$ | 86. $\frac{59}{45}$ |
| 67. $\frac{5}{9}$ | 72. $\frac{1}{3}$ | 77. $\frac{58}{15}$ | 82. $\frac{59}{45}$ | 87. $\frac{60}{45}$ |
| 68. $\frac{2}{7}$ | 73. $\frac{2}{3}$ | 78. $\frac{59}{15}$ | 83. $\frac{60}{45}$ | 88. $\frac{61}{45}$ |
| 69. $\frac{3}{8}$ | 74. $\frac{1}{3}$ | 79. $\frac{60}{15}$ | 84. $\frac{61}{45}$ | 89. $\frac{62}{45}$ |
| 70. $\frac{1}{4}$ | 75. $\frac{2}{3}$ | 80. $\frac{61}{15}$ | 85. $\frac{62}{45}$ | 90. $\frac{63}{45}$ |
| 71. $\frac{5}{9}$ | 76. $\frac{1}{3}$ | 81. $\frac{62}{15}$ | 86. $\frac{63}{45}$ | 91. $\frac{64}{45}$ |
| 72. $\frac{2}{7}$ | 77. $\frac{2}{3}$ | 82. $\frac{63}{15}$ | 87. $\frac{64}{45}$ | 92. $\frac{65}{45}$ |
| 73. $\frac{3}{8}$ | 78. $\frac{1}{3}$ | 83. $\frac{64}{15}$ | 88. $\frac{65}{45}$ | 93. $\frac{66}{45}$ |
| 74. $\frac{1}{4}$ | 79. $\frac{2}{3}$ | 84. $\frac{65}{15}$ | 89. $\frac{66}{45}$ | 94. $\frac{67}{45}$ |
| 75. $\frac{5}{9}$ | 80. $\frac{1}{3}$ | 85. $\frac{66}{15}$ | 90. $\frac{67}{45}$ | 95. $\frac{68}{45}$ |
| 76. $\frac{2}{7}$ | 81. $\frac{2}{3}$ | 86. $\frac{67}{15}$ | 91. $\frac{68}{45}$ | 96. $\frac{69}{45}$ |
| 77. $\frac{3}{8}$ | 82. $\frac{1}{3}$ | 87. $\frac{68}{15}$ | 92. $\frac{69}{45}$ | 97. $\frac{70}{45}$ |
| 78. $\frac{1}{4}$ | 83. $\frac{2}{3}$ | 88. $\frac{69}{15}$ | 93. $\frac{70}{45}$ | 98. $\frac{71}{45}$ |
| 79. $\frac{5}{9}$ | 84. $\frac{1}{3}$ | 89. $\frac{70}{15}$ | 94. $\frac{71}{45}$ | 99. $\frac{72}{45}$ |
| 80. $\frac{2}{7}$ | 85. $\frac{2}{3}$ | 90. $\frac{71}{15}$ | 95. $\frac{72}{45}$ | 100. $\frac{73}{45}$ |
| 81. $\frac{3}{8}$ | 86. $\frac{1}{3}$ | 91. $\frac{72}{15}$ | 96. $\frac{73}{45}$ | 101. $\frac{74}{45}$ |
| 82. $\frac{1}{4}$ | 87. $\frac{2}{3}$ | 92. $\frac{73}{15}$ | 97. $\frac{74}{45}$ | 102. $\frac{75}{45}$ |
| 83. $\frac{5}{9}$ | 88. $\frac{1}{3}$ | 93. $\frac{74}{15}$ | 98. $\frac{75}{45}$ | 103. $\frac{76}{45}$ |
| 84. $\frac{2}{7}$ | 89. $\frac{2}{3}$ | 94. $\frac{75}{15}$ | 99. $\frac{76}{45}$ | 104. $\frac{77}{45}$ |
| 85. $\frac{3}{8}$ | 90. $\frac{1}{3}$ | 95. $\frac{76}{15}$ | 100. $\frac{77}{45}$ | 105. $\frac{78}{45}$ |
| 86. $\frac{1}{4}$ | 91. $\frac{2}{3}$ | 96. $\frac{77}{15}$ | 101. $\frac{78}{45}$ | 106. $\frac{79}{45}$ |
| 87. $\frac{5}{9}$ | 92. $\frac{1}{3}$ | 97. $\frac{78}{15}$ | 102. $\frac{79}{45}$ | 107. $\frac{80}{45}$ |
| 88. $\frac{2}{7}$ | 93. $\frac{2}{3}$ | 98. $\frac{79}{15}$ | 103. $\frac{80}{45}$ | 108. $\frac{81}{45}$ |
| 89. $\frac{3}{8}$ | 94. $\frac{1}{3}$ | 99. $\frac{80}{15}$ | 104. $\frac{81}{45}$ | 109. $\frac{82}{45}$ |
| 90. $\frac{1}{4}$ | 95. $\frac{2}{3}$ | 100. $\frac{81}{15}$ | 105. $\frac{82}{45}$ | 110. $\frac{83}{45}$ |
| 91. $\frac{5}{9}$ | 96. $\frac{1}{3}$ | 101. $\frac{82}{15}$ | 106. $\frac{83}{45}$ | 111. $\frac{84}{45}$ |
| 92. $\frac{2}{7}$ | 97. $\frac{2}{3}$ | 102. $\frac{83}{15}$ | 107. $\frac{84}{45}$ | 112. $\frac{85}{45}$ |
| 93. $\frac{3}{8}$ | 98. $\frac{1}{3}$ | 103. $\frac{84}{15}$ | 108. $\frac{85}{45}$ | 113. $\frac{86}{45}$ |
| 94. $\frac{1}{4}$ | 99. $\frac{2}{3}$ | 104. $\frac{85}{15}$ | 109. $\frac{86}{45}$ | 114. $\frac{87}{45}$ |
| 95. $\frac{5}{9}$ | 100. $\frac{1}{3}$ | 105. $\frac{86}{15}$ | 110. $\frac{87}{45}$ | 115. $\frac{88}{45}$ |
| 96. $\frac{2}{7}$ | 101. $\frac{2}{3}$ | 106. $\frac{87}{15}$ | 111. $\frac{88}{45}$ | 116. $\frac{89}{45}$ |
| 97. $\frac{3}{8}$ | 102. $\frac{1}{3}$ | 107. $\frac{88}{15}$ | 112. $\frac{89}{45}$ | 117. $\frac{90}{45}$ |
| 98. $\frac{1}{4}$ | 103. $\frac{2}{3}$ | 108. $\frac{89}{15}$ | 113. $\frac{90}{45}$ | 118. $\frac{91}{45}$ |
| 99. $\frac{5}{9}$ | 104. $\frac{1}{3}$ | 109. $\frac{90}{15}$ | 114. $\frac{91}{45}$ | 119. $\frac{92}{45}$ |
| 100. $\frac{2}{7}$ | 105. $\frac{2}{3}$ | 110. $\frac{91}{15}$ | 115. $\frac{92}{45}$ | 120. $\frac{93}{45}$ |

ADDITION AND SUBTRACTION OF FRACTIONS

29. Oral.

Only similar fractions can be added or subtracted.

- | | | | |
|----------------------------------|------------------------------------|---------------------------------|-----------------------------------|
| 1. $\frac{1}{4} + \frac{3}{8}$ | 9. $\frac{1}{4} + \frac{2}{6}$ | 17. $\frac{7}{8} - \frac{1}{2}$ | 25. $\frac{3}{4} - \frac{2}{6}$ |
| 2. $\frac{1}{4} + \frac{2}{8}$ | 10. $\frac{1}{4} + \frac{5}{16}$ | 18. $\frac{1}{3} - \frac{1}{4}$ | 26. $\frac{5}{8} - \frac{1}{4}$ |
| 3. $2\frac{1}{2} + 2\frac{1}{3}$ | 11. $2\frac{1}{4} + 2\frac{1}{8}$ | 19. $\frac{2}{3} - \frac{1}{8}$ | 27. $\frac{5}{6} - \frac{1}{2}$ |
| 4. $\frac{1}{4} + \frac{1}{12}$ | 12. $\frac{1}{6} + \frac{4}{15}$ | 20. $\frac{4}{5} - \frac{1}{2}$ | 28. $\frac{7}{10} - \frac{2}{5}$ |
| 5. $\frac{1}{2} + \frac{2}{8}$ | 13. $\frac{1}{2} + \frac{2}{6}$ | 21. $\frac{1}{3} - \frac{1}{6}$ | 29. $5\frac{3}{4} - \frac{1}{6}$ |
| 6. $\frac{1}{8} + \frac{2}{6}$ | 14. $\frac{1}{8} + \frac{1}{7}$ | 22. $\frac{2}{3} - \frac{2}{6}$ | 30. $8\frac{5}{6} - 3\frac{1}{2}$ |
| 7. $4\frac{2}{3} + \frac{1}{6}$ | 15. $4\frac{1}{3} + 4\frac{1}{8}$ | 23. $\frac{1}{3} - \frac{1}{7}$ | 31. $9\frac{1}{5} - 2\frac{1}{8}$ |
| 8. $7\frac{4}{5} + \frac{3}{10}$ | 16. $2\frac{3}{4} + 6\frac{1}{12}$ | 24. $\frac{1}{6} - \frac{1}{8}$ | 32. $7\frac{5}{6} - \frac{1}{5}$ |

33. How do you add fractions?

35. I paid ₧2 $\frac{3}{4}$ for a shirt and ₧3 $\frac{1}{2}$ for a hat. How much did I pay for both?

36. Pedro earned ₧2 $\frac{1}{5}$ one week and ₧2 $\frac{1}{5}$ the next. How much did he earn in the two weeks? Analyze.

37. How much is $\frac{1}{4} + \frac{1}{2} - \frac{1}{8}$? $\frac{2}{5} + \frac{1}{2} - \frac{3}{10}$?

38. A man sold 3 lots containing 1 $\frac{1}{5}$ Ha, 1 $\frac{1}{2}$ Ha, and 1 $\frac{1}{10}$ Ha, respectively. How many hektars of land did he sell?

39. Pedro had ₧2 $\frac{3}{4}$, Juan had ₧4 $\frac{1}{2}$, and Luis had ₧2 $\frac{3}{4}$. How much money had they all?

40. Maria had ₧ $\frac{9}{10}$ and spent ₧ $\frac{1}{5}$. How much had she left?

41. I paid ₧ $\frac{1}{2}$ for a knife and sold it for ₧ $\frac{4}{5}$. How much did I gain? Analyze.

30. Written.

Add $\frac{2}{5}$, $\frac{2}{5}$, and $\frac{7}{15}$.

$$\begin{array}{r} \frac{2}{5} = \frac{27}{135} \\ \frac{2}{5} = \frac{54}{135} \\ \frac{7}{15} = \frac{63}{135} \\ \hline \frac{58}{135} = 1\frac{22}{45} \end{array}$$

Add 8 $\frac{2}{5}$, 10 $\frac{2}{5}$, and 11 $\frac{7}{15}$.

$$\begin{array}{r} 8\frac{2}{5} = 8\frac{27}{135} \\ 10\frac{2}{5} = 10\frac{54}{135} \\ 11\frac{7}{15} = 11\frac{63}{135} \\ \hline 29\frac{43}{45} = 30\frac{18}{45} \end{array}$$

1. How do you add mixed numbers?

Find the sum of:

- | | | |
|---|---|--|
| 2. $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$ | 6. $\frac{4}{5}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{10}$ | 10. 10 $\frac{2}{3}$, 9 $\frac{5}{8}$, 6 $\frac{3}{4}$ |
| 3. $\frac{3}{7}$, $\frac{5}{14}$, $\frac{9}{28}$ | 7. $\frac{2}{3}$, $\frac{1}{8}$, $\frac{7}{9}$, $\frac{4}{27}$ | 11. 11 $\frac{3}{5}$, 7 $\frac{3}{4}$, 11 $\frac{7}{10}$ |
| 4. $\frac{2}{5}$, $\frac{7}{10}$, $\frac{5}{6}$ | 8. $\frac{7}{15}$, $\frac{2}{20}$, $\frac{5}{12}$, $\frac{11}{30}$ | 12. 4 $\frac{1}{3}$, 10, 7 $\frac{3}{4}$, 5 $\frac{5}{8}$ |
| 5. $\frac{3}{7}$, $\frac{5}{8}$, $\frac{9}{14}$ | 9. $\frac{4}{5}$, $\frac{7}{8}$, $\frac{13}{20}$, $\frac{9}{40}$ | 13. 9 $\frac{5}{8}$, $\frac{5}{8}$, 3 $\frac{3}{4}$, 7 $\frac{7}{12}$ |
| 14. 12 $\frac{1}{5}$, 13 $\frac{2}{8}$, 15 $\frac{7}{10}$, 6 $\frac{1}{4}$ | 17. 32 $\frac{1}{2}$, 45 $\frac{7}{8}$, 60 $\frac{3}{8}$ | |
| 15. 8 $\frac{1}{8}$, 10 $\frac{2}{5}$, 9 $\frac{2}{10}$, 21 $\frac{1}{2}$ | 18. 121 $\frac{1}{8}$, 43 $\frac{2}{5}$, 80 $\frac{7}{10}$ | |
| 16. 12 $\frac{2}{3}$, 1 $\frac{1}{4}$, $\frac{5}{8}$, 16 $\frac{2}{21}$ | 19. 27 $\frac{5}{8}$, 110 $\frac{1}{4}$, 22 $\frac{9}{10}$ | |

$$\begin{array}{r} 20. \ 135\frac{3}{8} \\ 1622\frac{7}{8} \\ \underline{763\frac{3}{8}} \end{array}$$

$$\begin{array}{r} 21. \ 427\frac{3}{8} \\ 1603\frac{3}{8} \\ \underline{762\frac{7}{8}} \end{array}$$

$$\begin{array}{r} 22. \ 703\frac{1}{6} \\ 2170\frac{3}{4} \\ \underline{781\frac{7}{10}} \end{array}$$

$$\begin{array}{r} 23. \ 902\frac{1}{4} \\ 2043\frac{7}{12} \\ \underline{672\frac{5}{6}} \end{array}$$

31. Written.

From $13\frac{1}{2}$ subtract $6\frac{4}{5}$.

$$\begin{array}{l} 13\frac{1}{2} = 13\frac{5}{10} = 12\frac{15}{10} \\ 6\frac{4}{5} = 6\frac{8}{10} = \underline{6\frac{8}{10}} \\ \frac{6}{10} \end{array}$$

Change $\frac{1}{2}$ and $\frac{4}{5}$ to the similar fractions $\frac{5}{10}$ and $\frac{8}{10}$; then we have $13\frac{5}{10} - 6\frac{8}{10}$. Since we cannot subtract $\frac{8}{10}$ from $\frac{5}{10}$, we take 1 unit, or $\frac{10}{10}$, from the 13 units, and put it with the $\frac{5}{10}$, thus $13\frac{5}{10}$ becomes $12\frac{15}{10}$.
 $12\frac{15}{10} - 6\frac{8}{10} = 6\frac{7}{10}$

1. How do you subtract mixed numbers?

2. $\frac{5}{6} - \frac{2}{3}$

7. $5\frac{2}{3} - 2\frac{2}{3}$

12. $8\frac{2}{10} - 5\frac{3}{5}$

17. $24\frac{3}{4} - 10\frac{5}{14}$

3. $\frac{5}{7} - \frac{1}{8}$

8. $8\frac{1}{6} - 3\frac{5}{12}$

13. $20\frac{1}{4} - 7\frac{3}{8}$

18. $32\frac{1}{3} - 20\frac{5}{6}$

4. $\frac{5}{8} - \frac{1}{4}$

9. $11\frac{2}{3} - 7\frac{3}{8}$

14. $16\frac{7}{20} - 4\frac{7}{10}$

19. $41\frac{5}{6} - 18\frac{3}{4}$

5. $\frac{2}{9} - \frac{2}{6}$

10. $14\frac{1}{4} - 10\frac{3}{8}$

15. $15\frac{2}{5} - 7\frac{3}{8}$

20. $50\frac{1}{2} - 22\frac{7}{8}$

6. $5 - 2\frac{2}{3}$

11. $12\frac{1}{2} - 6\frac{4}{5}$

16. $25 - 8\frac{5}{12}$

21. $45\frac{1}{4} - 25\frac{3}{8}$

First add; then subtract:

22. $\begin{array}{r} 25\frac{1}{2} \\ 17\frac{4}{6} \\ \hline \end{array}$

23. $\begin{array}{r} 37\frac{1}{6} \\ 22\frac{5}{8} \\ \hline \end{array}$

24. $\begin{array}{r} 41\frac{1}{4} \\ 16\frac{3}{8} \\ \hline \end{array}$

25. $\begin{array}{r} 47\frac{2}{6} \\ 15\frac{3}{4} \\ \hline \end{array}$

26. $\begin{array}{r} 49\frac{3}{8} \\ 25\frac{3}{8} \\ \hline \end{array}$

27. $\begin{array}{r} 67\frac{1}{3} \\ 40\frac{4}{6} \\ \hline \end{array}$

28. $\begin{array}{r} 72\frac{2}{3} \\ 50\frac{2}{10} \\ \hline \end{array}$

29. $\begin{array}{r} 65\frac{6}{7} \\ 14\frac{1}{3} \\ \hline \end{array}$

30. $\begin{array}{r} 69\frac{2}{11} \\ 20\frac{1}{2} \\ \hline \end{array}$

31. $\begin{array}{r} 58\frac{2}{15} \\ 40\frac{1}{2} \\ \hline \end{array}$

32. $\begin{array}{r} 83\frac{2}{6} \\ 30\frac{1}{2} \\ \hline \end{array}$

33. $\begin{array}{r} 88\frac{5}{12} \\ 31\frac{5}{6} \\ \hline \end{array}$

34. $\begin{array}{r} 243\frac{2}{16} \\ 124\frac{5}{8} \\ \hline \end{array}$

35. $\begin{array}{r} 304\frac{5}{12} \\ 152\frac{1}{4} \\ \hline \end{array}$

36. $\begin{array}{r} 325\frac{3}{8} \\ 160\frac{1}{4} \\ \hline \end{array}$

37. $\begin{array}{r} 1462\frac{5}{16} \\ 781\frac{5}{8} \\ \hline \end{array}$

38. $\begin{array}{r} 2407\frac{3}{6} \\ 1523\frac{3}{4} \\ \hline \end{array}$

39. $\begin{array}{r} 4076\frac{2}{10} \\ 983\frac{3}{5} \\ \hline \end{array}$

40. $\begin{array}{r} 6092\frac{4}{7} \\ 4127\frac{4}{7} \\ \hline \end{array}$

41. $\begin{array}{r} 2463\frac{3}{8} \\ 927\frac{5}{8} \\ \hline \end{array}$

42. $\begin{array}{r} 7027\frac{7}{10} \\ 2643\frac{3}{4} \\ \hline \end{array}$

43. $\begin{array}{r} 9407\frac{2}{6} \\ 3662\frac{1}{3} \\ \hline \end{array}$

44. $\begin{array}{r} 16745\frac{3}{5} \\ 7382\frac{5}{5} \\ \hline \end{array}$

32. Written.

1. If a clock $53\frac{7}{8}$ centimeters high is placed on a shelf $148\frac{5}{8}$ centimeters high, how far is it from the top of the clock to the floor?

2. From a roll of sinamay containing $23\frac{1}{2}$ meters, Manuela cut $4\frac{1}{4}$ meters for a camisa and $14\frac{3}{8}$ meters for a skirt. How many meters were left?

3. A carpenter received as wages in one month ₱ 52 $\frac{3}{4}$. His expenses during the month were: ₱ 22 $\frac{1}{2}$ for food, ₱ 10 $\frac{1}{4}$ for rent, ₱ 4 $\frac{1}{5}$ for clothing, ₱ 5 $\frac{7}{10}$ for incidentals. How much did he save?

4. A farmer owns a triangular piece of land 215 $\frac{1}{3}$ meters on one side, 392 $\frac{2}{3}$ meters on another, and 195 $\frac{5}{6}$ meters on the third. How many meters of fence will he need to inclose it?

5. If Josefa has a strip of cloth $67\frac{3}{10}$ centimeters wide, how much must she cut off to leave a strip $49\frac{1}{2}$ centimeters wide?

6. A mirror $73\frac{3}{8}$ centimeters by $45\frac{3}{8}$ centimeters was set in a frame that covered $1\frac{5}{8}$ centimeters from each edge. What are the dimensions of the mirror not covered by the frame?

7. Alfredo deposited in the Postal Savings Bank ₱ 9 $\frac{1}{2}$, ₱ 14 $\frac{4}{5}$, ₱ 5 $\frac{3}{10}$, and ₱ 6 $\frac{1}{4}$. He drew out ₱ 3 $\frac{3}{4}$, ₱ 7 $\frac{2}{10}$, and ₱ 2 $\frac{2}{5}$. How much had he left in the bank?

8. A man gave $\frac{1}{3}$ of his money to his son, $\frac{2}{10}$ of it to his daughter, and $\frac{5}{16}$ to his wife. What part of his money was left?

9. Mr. Villalon divided his farm of 137 hektars into 4 fields. In the first field there were 20 $\frac{3}{8}$ hektars, in the second 36 $\frac{7}{8}$ hektars, and in the third 45 $\frac{5}{8}$ hektars. How many hektars were there in the fourth field?

10. Mrs. Reyes spent ₱ 6 $\frac{3}{5}$ for coffee, ₱ 2 $\frac{7}{10}$ for cocoa, ₱ 3 $\frac{1}{5}$ for lard, ₱ 2 $\frac{7}{10}$ for sweet potatoes, and ₱ 1 $\frac{2}{5}$ for oranges. How much less than ₱ 20 did she spend?

MULTIPLICATION OF FRACTIONS

33. Written.

Multiply $2\frac{2}{3}$ by $\frac{3}{4}$.

This means to find $\frac{3}{4}$ of $2\frac{2}{3}$, or $\frac{3}{4}$ of $\frac{8}{3}$.

Since $\frac{1}{4}$ of $\frac{8}{3} = \frac{2}{3}$, $\frac{3}{4}$ of $\frac{8}{3} = \frac{6}{3}$, and $\frac{3}{4}$ of $\frac{8}{3} = \frac{6}{3}$, or, $2\frac{2}{3} \times \frac{3}{4} = \frac{6}{3}$.

1. How do you multiply a fraction by a fraction?
2. How do you multiply mixed numbers together?
3. How do you multiply a fraction and a mixed number together?

Use cancelation whenever it is possible.

4. $\frac{3}{4} \times \frac{4}{5}$

10. $\frac{1}{2} \times \frac{2}{5} \times \frac{5}{7}$

16. $2\frac{1}{3} \times \frac{2}{7} \times \frac{9}{10}$

5. $\frac{5}{8} \times \frac{2}{5}$

11. $\frac{3}{5} \times \frac{6}{7} \times \frac{5}{6}$

17. $3\frac{1}{5} \times \frac{7}{8} \times \frac{5}{16}$

6. $\frac{5}{6} \times \frac{4}{5}$

12. $\frac{4}{9} \times \frac{3}{8} \times \frac{6}{10}$

18. $25 \times \frac{4}{15} \times \frac{3}{8}$

7. $\frac{4}{9}$ of $\frac{3}{4}$

13. $\frac{3}{5} \times \frac{3}{3} \times \frac{5}{16}$

19. $3\frac{1}{3} \times 36 \times 4\frac{1}{8}$

8. $\frac{7}{9}$ of $\frac{3}{14}$

14. $10 \times \frac{4}{5} \times \frac{3}{16}$

20. $24 \times 1\frac{1}{6} \times \frac{3}{14}$

9. $\frac{3}{8}$ of $\frac{9}{8}$

15. $18 \times \frac{4}{5} \times \frac{3}{4}$

21. $5\frac{1}{3} \times \frac{7}{8} \times \frac{9}{21}$

Multiply $11\frac{1}{2}$ by 9.

Multiply 36 by $8\frac{1}{2}$.

$$\begin{array}{r} 11\frac{1}{2} \\ \times 9 \\ \hline \end{array}$$

$$\begin{array}{r} 36 \\ \times 8\frac{1}{2} \\ \hline \end{array}$$

$$9 \times \frac{1}{2} = 7\frac{1}{2}$$

$$9 \times 11 = 99$$

$$9 \times 11\frac{1}{2} = 106\frac{1}{2}$$

$$\frac{1}{2} \times 36 = 14\frac{1}{2}$$

$$8 \times 36 = 288$$

$$8\frac{1}{2} \times 36 = 302\frac{1}{2}$$

22. How do you multiply a whole number and a mixed number together?

Multiply:

23. $15\frac{5}{8}$ by 8

26. $95\frac{3}{11}$ by 35

29. 75 by $11\frac{3}{8}$

24. $22\frac{3}{4}$ by 11

27. $125\frac{3}{8}$ by 41

30. 90 by $12\frac{1}{4}$

25. $35\frac{3}{8}$ by 12

28. $425\frac{1}{4}$ by 31

31. 160 by $14\frac{3}{4}$

32. $12\frac{1}{2} \times 2\frac{2}{5} \times \frac{4}{15} \times 1\frac{3}{8}$

33. $6\frac{1}{4} \times \frac{4}{7} \times 4\frac{1}{5} \times \frac{3}{10}$

34. $22 \times \frac{7}{30} \times \frac{2}{11} \times \frac{3}{20}$

35. $35 \times 1\frac{4}{7} \times \frac{2}{11} \times \frac{3}{20}$

36. $7\frac{1}{2} \times 16\frac{2}{3} \times \frac{7}{25} \times \frac{4}{21}$

37. $8\frac{1}{3} \times 3\frac{2}{5} \times \frac{7}{6} \times \frac{3}{10}$

38. $12\frac{1}{10} \times \frac{4}{11} \times 1\frac{1}{3} \times \frac{2}{22}$

39. $\frac{24}{5} \times 1\frac{1}{12} \times 120 \times \frac{5}{13}$

40. $4\frac{4}{5} \times 12\frac{1}{2} \times \frac{2}{40} \times 1\frac{1}{7}$

41. $8\frac{2}{4} \times 2\frac{8}{7} \times 3\frac{1}{5} \times \frac{8}{8}$

42. $\frac{4}{7} \times \frac{2}{4} \times \frac{4}{5} \times 28$

43. $62\frac{1}{2} \times \frac{4}{25} \times \frac{8}{5} \times 13\frac{1}{2}$

34. Oral.*Find the cost of:*

1. $3\frac{1}{4}$ meters of cloth at 40 centavos a meter.
2. 12 cavanos of maize at ₱ $2\frac{1}{4}$ a cavan.
3. 10 kilos of butter at ₱ $1\frac{3}{5}$ a kilo.
4. 30 dozen eggs at ₱ $\frac{2}{3}$ a dozen.
5. 5 piculs of hemp at ₱ $21\frac{1}{2}$ a picul.
6. 12 goats at ₱ $3\frac{1}{4}$ each.
7. 30 papayas at $2\frac{1}{2}$ centavos each.
8. 40 pineapples at $6\frac{1}{2}$ centavos each.
9. $7\frac{1}{2}$ gantas of peas at 40 centavos a ganta.
10. 15 ducks at ₱ $\frac{4}{5}$ each.
11. At 30 centavos a meter, what will $\frac{4}{5}$ of a meter of cloth cost? $1\frac{2}{5}$ meters? $2\frac{2}{5}$ meters? $10\frac{1}{5}$ meters?
12. What will $3\frac{2}{3}$ dozen bananas cost at 12 centavos a dozen?
13. Find the cost of 25 sacks of salt at ₱ $1\frac{1}{2}$ a sack.
14. A farmer had 30 sheep. He sold $\frac{2}{3}$ of them at ₱ $3\frac{1}{2}$ each. How much did he receive?
15. What should I pay for 12 oranges at $3\frac{1}{3}$ centavos each, and 20 bananas at $1\frac{1}{2}$ centavos each?
16. Sixto earns ₱ $\frac{2}{3}$, and Sabino $\frac{2}{3}$ as much. How much do they both earn?

35. Written.

1. How far will a man walk in 18 days at the rate of $28\frac{7}{10}$ kilometers a day?

2. Rafael had ₱4 $\frac{4}{5}$, and Pedro had $\frac{2}{3}$ as much. How much had they together? Analyze.

3. I bought a horse for ₱151 $\frac{1}{4}$ and sold it for $\frac{4}{5}$ of the cost. How much did I lose?

4. Find the cost of 23 $\frac{3}{4}$ meters of sinamay at ₱ $\frac{2}{5}$ a meter, and 16 $\frac{1}{2}$ meters of muslin at ₱ $\frac{1}{6}$ a meter.

5. I bought 17 $\frac{1}{2}$ quintals of sugar at ₱5 $\frac{1}{5}$ per quintal, and sold it at ₱5 $\frac{3}{4}$ per quintal. How much did I gain?

6. A merchant had 43 $\frac{1}{5}$ meters of satin. He sold one half of it for ₱1 $\frac{7}{8}$ a meter, and the other half for ₱1 $\frac{3}{4}$ a meter. How much did he receive for it?

7. I sold 22 $\frac{1}{2}$ cavanese of rice at ₱5 $\frac{1}{5}$ a cavan, and thus gained ₱6 $\frac{3}{4}$. What did the rice cost?

8. I have a piece of cloth containing 87 $\frac{1}{2}$ meters. If I sell $\frac{2}{5}$ of it at ₱1 $\frac{1}{5}$ a meter, how much will I receive?

9. Find the cost of 72 slates at ₱ $\frac{2}{5}$ each, and 7 $\frac{1}{2}$ dozen copy books at ₱2 $\frac{3}{5}$ a dozen.

DIVISION OF FRACTIONS**36. Written.**

$$12 \div 3 = ? \quad 12 \div 3 = 12 \times \frac{1}{3} = 4$$

$$12 \div \frac{1}{3} = ? \quad 12 \div \frac{1}{3} = 12 \times \frac{3}{1} = 36$$

$$\frac{7}{8} \div \frac{3}{4} = ? \quad \frac{7}{8} \div \frac{3}{4} = \frac{7}{8} \times \frac{4}{3} = \frac{7}{6} = 1\frac{1}{6}$$

To divide by a fraction, invert the divisor and multiply. Change whole and mixed numbers to improper fractions before inverting the divisor.

Use cancelation whenever it is possible.

Divide:

- | | | |
|--------------------------------------|--|---|
| 1. $\frac{5}{12}$ by $\frac{5}{8}$ | 9. $2\frac{1}{4}$ by $\frac{3}{8}$ | 17. $2\frac{1}{8}$ by $3\frac{1}{2}$ |
| 2. $\frac{11}{12}$ by $\frac{5}{4}$ | 10. $3\frac{1}{8}$ by $\frac{8}{9}$ | 18. $3\frac{3}{8}$ by $2\frac{1}{4}$ |
| 3. $3\frac{3}{4}$ by $\frac{7}{8}$ | 11. $16\frac{2}{3}$ by $\frac{4}{9}$ | 19. $6\frac{2}{3} \times 2\frac{5}{8}$ by $4\frac{1}{2}$ |
| 4. $8\frac{2}{5}$ by $2\frac{4}{5}$ | 12. $33\frac{1}{2}$ by $2\frac{1}{12}$ | 20. $5\frac{5}{8} \times 10\frac{1}{8}$ by $3\frac{1}{8}$ |
| 5. $6\frac{1}{4}$ by $\frac{5}{8}$ | 13. $17\frac{1}{2}$ by $8\frac{1}{8}$ | 21. $14\frac{2}{3} \times 1\frac{1}{11}$ by $7\frac{1}{2}$ |
| 6. $3\frac{5}{8}$ by $1\frac{3}{8}$ | 14. $\frac{3}{4} \times 2\frac{2}{3}$ by $2\frac{2}{3}$ | 22. $3\frac{3}{7} \times 2\frac{1}{10}$ by $7\frac{1}{2}$ |
| 7. $7\frac{1}{7}$ by $2\frac{1}{2}$ | 15. $2\frac{1}{3} \times \frac{3}{14}$ by $\frac{7}{8}$ | 23. $4\frac{5}{8} \times 8\frac{4}{5}$ by $9\frac{9}{10}$ |
| 8. $12\frac{1}{4}$ by $4\frac{2}{3}$ | 16. $11\frac{1}{4} \times \frac{2}{9}$ by $\frac{5}{12}$ | 24. $10\frac{5}{7} \times 4\frac{9}{10}$ by $11\frac{1}{4}$ |
| 25. $8\frac{1}{3}$ by 5 | 28. $6\frac{2}{3}$ by 10 | 31. 8 by $2\frac{2}{3}$ |
| 26. $5\frac{5}{8}$ by 9 | 29. $17\frac{2}{3}$ by 11 | 32. 25 by $2\frac{1}{4}$ |
| 27. $9\frac{2}{5}$ by 8 | 30. $13\frac{1}{5}$ by 22 | 33. 35 by $9\frac{1}{8}$ |
| | | 36. 99 by $6\frac{2}{3}$ |

37. Oral.*Divide:*

- | | | | |
|------------------------------------|------------------------------------|-------------------------------------|--------------------------------------|
| 1. $\frac{3}{4}$ by $\frac{1}{8}$ | 6. $\frac{3}{4}$ by $\frac{1}{2}$ | 11. $\frac{1}{2}$ by $\frac{1}{8}$ | 16. $\frac{5}{8}$ by $\frac{5}{8}$ |
| 2. $\frac{5}{8}$ by $\frac{1}{2}$ | 7. $\frac{8}{9}$ by $\frac{1}{4}$ | 12. $\frac{3}{10}$ by $\frac{1}{5}$ | 17. $\frac{1}{8}$ by $\frac{1}{12}$ |
| 3. $\frac{4}{9}$ by $\frac{2}{3}$ | 8. $\frac{1}{6}$ by $\frac{4}{9}$ | 13. $\frac{7}{10}$ by $\frac{1}{2}$ | 18. $\frac{3}{8}$ by $\frac{5}{8}$ |
| 4. $\frac{7}{8}$ by $\frac{3}{4}$ | 9. $\frac{7}{2}$ by $\frac{1}{4}$ | 14. $\frac{8}{9}$ by $\frac{3}{2}$ | 19. $2\frac{1}{10}$ by $\frac{1}{2}$ |
| 5. $\frac{5}{8}$ by $\frac{1}{12}$ | 10. $\frac{5}{8}$ by $\frac{5}{6}$ | 15. $\frac{3}{6}$ by $\frac{3}{10}$ | 20. $\frac{7}{12}$ by $\frac{5}{8}$ |

21. If a man saves ₦ $\frac{3}{8}$ a day, how long will it take him to save ₦ $1\frac{1}{8}$? ₦ $2\frac{2}{3}$? ₦ $5\frac{2}{3}$? ₦6?

22. A boy earned ₦ $2\frac{2}{3}$ in 6 days. How much did he earn in a day? In 5 days? Analyze.

23. If 5 hats cost ₦ $3\frac{3}{4}$, what does 1 hat cost? 3 hats?

24. ₦ $2\frac{7}{10}$ is divided equally among 9 boys. How much does each boy get? Analyze.

25. If it is $24\frac{1}{2}$ meters around a square, how long is each side?

38. Written.

Divide $\frac{4}{7} \times \frac{7}{15}$ by $\frac{9}{10} \times \frac{4}{9}$.

$$\frac{4}{7} \times \frac{7}{15} \div \frac{9}{10} \times \frac{4}{9} = \frac{4}{7} \times \frac{7}{15} \times \frac{10}{9} \times \frac{9}{4} = \frac{2}{3}$$

If a divisor contains two or more factors, invert them all.

1. Divide $\frac{4}{5}$ of $\frac{8}{10}$ of $\frac{3}{4}$ by $\frac{3}{7}$ of $\frac{7}{12}$ of $\frac{7}{10}$.
2. Divide $\frac{2}{5}$ of $\frac{5}{8}$ of $\frac{8}{9}$ of $\frac{10}{11}$ by $\frac{5}{9}$ of $\frac{6}{11}$ of $\frac{5}{12}$ of 12.
3. Divide $\frac{7}{22} \times 16\frac{1}{2} \times \frac{4}{21} \times 49$ by $4\frac{2}{3} \times 7\frac{1}{2} \times 5\frac{1}{3} \times \frac{7}{15}$.
4. Divide $1\frac{1}{7} \times 4\frac{1}{5} \times \frac{7}{9} \times 9$ by $8\frac{2}{3} \times 5\frac{1}{4} \times 1\frac{1}{7} \times 6\frac{2}{3}$.
5. Divide $33\frac{1}{3} \times \frac{7}{15} \times \frac{15}{18} \times 48$ by $7\frac{1}{8} \times 1\frac{2}{11} \times 7\frac{1}{2} \times 28$.
6. Divide $6\frac{2}{4} \times 16\frac{2}{3} \times 5\frac{2}{5} \times 6\frac{2}{7}$ by $6\frac{2}{7} \times 7\frac{1}{8} \times 4\frac{1}{5} \times 2\frac{7}{9}$.
7. If a train runs $19\frac{3}{4}$ kilometers in 21 minutes, how far will it run in 1 minute? In 40 minutes? Analyze.
8. At ₱ $\frac{7}{8}$ each, how many books can I buy for ₱ 63?
9. If a farmer sells $10\frac{1}{2}$ cavanes of rice for ₱ $56\frac{7}{10}$, what will he get for 25 cavanes at the same rate? Analyze.
10. If a boy saves ₱ $3\frac{1}{5}$ a month, how many months will it take him to save ₱ 40?
11. How many steps will it take to walk 1328 meters, each step being $\frac{4}{5}$ of a meter long?
12. What is the price of coal per ton, when $7\frac{1}{2}$ tons cost ₱ 96?
13. Mr. Santos paid ₱ 297 for $4\frac{2}{3}$ hektars of land. What was the price per hektar? At the same rate, what must be paid for $6\frac{2}{3}$ hektars? Analyze.
14. How many bottles holding $\frac{3}{10}$ of a liter each can be filled from a can containing $67\frac{1}{2}$ liters of oil?
15. At the rate of 30 ducks for ₱ 24, how many ducks can I buy for ₱ 36? Analyze.



39. Written.

Find the cost of each when :

1. 6 hams cost ₱51 $\frac{3}{4}$.
2. 8 kilos of tea cost ₱19 $\frac{1}{6}$.
3. 18 melons cost ₱5 $\frac{2}{3}$.
4. 2 bags of salt cost ₱7 $\frac{1}{6}$.
5. 24 brooms cost ₱21 $\frac{3}{8}$.
6. 36 cans of corn cost ₱14 $\frac{3}{8}$.
7. 7 $\frac{1}{2}$ kilos of nuts cost ₱6 $\frac{3}{4}$.
8. 48 cans of peas cost ₱14 $\frac{3}{8}$.
9. 45 kilos of sugar cost ₱13 $\frac{1}{2}$.
10. 7 $\frac{1}{2}$ kilos of butter cost ₱12.
11. 24 cans of lard cost ₱33 $\frac{3}{8}$.
12. 18 kilos of fresh grapes cost ₱31 $\frac{1}{2}$.
13. 22 kilos of cheese cost ₱35 $\frac{1}{6}$.
14. At the rate of 5 cans for ₱2, how many cans of tomatoes can I buy for ₱4 $\frac{1}{2}$? Analyze.
15. If I pay 14 centavos for 4 oranges, what should I pay for 2 $\frac{3}{4}$ dozen oranges at the same rate?
16. A lady exchanged 5 $\frac{1}{2}$ dozen eggs at ₱ $\frac{2}{3}$ a dozen for rice at ₱ $\frac{1}{4}$ a ganta. How many gantas did she get? Analyze.
17. If 5 liters of alcohol cost ₱6 $\frac{3}{4}$, what will 1 liter cost? What will 8 liters cost? Analyze.

COMPLEX FRACTIONS

40. Written.

An indicated division of fractions is sometimes called a **complex fraction**.

$$\frac{3\frac{1}{2}}{\frac{5}{6}} = ? \quad \frac{3\frac{1}{2}}{\frac{5}{6}} = 3\frac{1}{2} \div \frac{5}{6} = 3\frac{1}{2} \times \frac{6}{5} = 10\frac{3}{5} \div \frac{5}{6} = \frac{10}{5} \times \frac{6}{1} = 4.$$

Change to the simplest form :

- | | | | | |
|---------------------------------------|---------------------------------------|--|---|--|
| 1. $\frac{\frac{9}{14}}{\frac{3}{7}}$ | 4. $\frac{\frac{8}{4}}{\frac{1}{7}}$ | 7. $\frac{\frac{2\frac{1}{2}}{3\frac{1}{2}}}{\frac{3\frac{1}{2}}{3\frac{1}{2}}}$ | 10. $\frac{\frac{2\frac{2}{5}}{2\frac{1}{7}}}{\frac{2\frac{1}{7}}{2\frac{1}{7}}}$ | 13. $\frac{\frac{3}{5} \times \frac{5}{8}}{\frac{4}{5} \times \frac{7}{8}}$ |
| 2. $\frac{\frac{7}{12}}{\frac{5}{6}}$ | 5. $\frac{\frac{25}{6}}{\frac{6}{8}}$ | 8. $\frac{\frac{1\frac{3}{4}}{\frac{5}{8}}}{\frac{5}{8}}$ | 11. $\frac{\frac{2\frac{5}{4}}{\frac{4}{5}} \times \frac{4}{5}}{\frac{5}{8}}$ | 14. $\frac{\frac{3\frac{3}{8}}{2\frac{1}{7}} \times \frac{3}{7}}{2\frac{1}{7} \times \frac{2}{5}}$ |
| 3. $\frac{\frac{8}{15}}{\frac{4}{6}}$ | 6. $\frac{\frac{7}{11}}{14}$ | 9. $\frac{\frac{7}{9}}{4\frac{2}{3}}$ | 12. $\frac{6 \times \frac{3}{4}}{\frac{3}{8}}$ | 15. $\frac{\frac{5}{9} \text{ of } 2\frac{4}{7}}{\frac{5}{14} \text{ of } 7\frac{1}{3}}$ |

FRACTIONAL RELATIONS

41. Oral.

- What part of 6 is 3? What part of 8 is 2?
- What part of 12 is 6? What part of 15 is 5?

To find what part the second of two numbers is of the first, divide the second by the first.

What part of:

- | | | | |
|-------------|-------------|---------------|---------------|
| 3. 6 is 5? | 6. 15 is 5? | 9. 15 is 8? | 12. 25 is 10? |
| 4. 7 is 3? | 7. 16 is 7? | 10. 30 is 18? | 13. 30 is 20? |
| 5. 12 is 2? | 8. 24 is 6? | 11. 22 is 11? | 14. 28 is 7? |

42. Written.

What part of:

- | | | | |
|--------------|----------------------------|----------------------------|-----------------------------|
| 1. 28 is 14? | 4. 45 is 35? | 7. 21 is 4 $\frac{1}{5}$? | 10. 55 is 7 $\frac{1}{3}$? |
| 2. 35 is 15? | 5. 80 is 32? | 8. 12 is 4 $\frac{1}{2}$? | 11. 12 is 4 $\frac{1}{5}$? |
| 3. 64 is 24? | 6. 18 is 2 $\frac{1}{4}$? | 9. 13 is 3 $\frac{1}{4}$? | 12. 15 is 4 $\frac{1}{7}$? |

13. $3\frac{1}{6}$ is 2? 17. $7\frac{1}{6}$ is 4? 21. $3\frac{2}{3}$ is $1\frac{1}{6}$? 25. $5\frac{1}{6}$ is $3\frac{1}{4}$?
 14. $6\frac{2}{3}$ is 3? 18. $6\frac{2}{3}$ is 5? 22. $4\frac{1}{2}$ is $2\frac{1}{4}$? 26. $\frac{5}{6}$ is $\frac{5}{6}$?
 15. $8\frac{1}{8}$ is 5? 19. $5\frac{2}{3}$ is 2? 23. $5\frac{1}{4}$ is $4\frac{2}{3}$? 27. $\frac{5}{6}$ is $\frac{2}{3}$?
 16. $7\frac{1}{2}$ is 6? 20. $\frac{2}{3}$ is $\frac{1}{6}$? 24. $4\frac{1}{6}$ is $3\frac{2}{3}$? 28. $\frac{2}{3}$ is $\frac{2}{11}$?

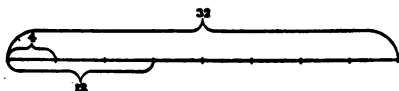
43. Written.

12 is $\frac{2}{3}$ of what number?

$\frac{2}{3}$ of the number is 12.

$\frac{1}{3}$ of the number is $\frac{1}{3}$ of 12, or 4.

$\frac{1}{3}$ of the number is 8×4 , or 32.



Illustrate each of the next ten exercises with a diagram similar to the one given above. Give analysis for each.

1. 15 is $\frac{3}{4}$ of what number? 6. 80 is $\frac{2}{3}$ of what number?
 2. 20 is $\frac{4}{5}$ of what number? 7. 60 is $\frac{5}{6}$ of what number?
 3. 12 is $\frac{3}{5}$ of what number? 8. 150 is $\frac{5}{6}$ of what number?
 4. 24 is $\frac{2}{3}$ of what number? 9. 240 is $\frac{2}{3}$ of what number?
 5. 25 is $\frac{5}{6}$ of what number? 10. 155 is $\frac{5}{11}$ of what number?

44. Oral.

Find the number of which:

1. 8 is $\frac{2}{3}$ 5. 15 is $\frac{5}{6}$ 9. 30 is $\frac{3}{4}$ 13. 90 is $\frac{3}{4}$
 2. 9 is $\frac{3}{5}$ 6. 10 is $\frac{5}{6}$ 10. 40 is $\frac{4}{5}$ 14. 120 is $\frac{2}{3}$
 3. 12 is $\frac{2}{3}$ 7. 22 is $\frac{2}{5}$ 11. 25 is $\frac{5}{6}$ 15. 150 is $\frac{5}{6}$
 4. 20 is $\frac{2}{3}$ 8. 12 is $\frac{4}{5}$ 12. 60 is $\frac{6}{7}$ 16. 210 is $\frac{2}{3}$

17. If $\frac{2}{3}$ of a Ha of land is worth ₦60, what are $1\frac{1}{2}$ Ha worth?

18. A man sold a horse for ₦80 which was $\frac{4}{5}$ of what it cost him. How much did the horse cost?

19. A man had ₦80 and spent ₦30. What part of his money did he spend? What part had he left?

20. In a school of 90 pupils, 50 are boys and 40 are girls. What part are boys? What part are girls?

REVIEW OF FRACTIONS

45. Written.

1. A farmer exchanged 12 dozen eggs at $\text{P } \frac{2}{3}$ a dozen for beans at $\text{P } \frac{1}{4}$ a ganta. How many gantas of beans did he get?

2. If $\frac{3}{10}$ of a meter of cloth costs $\text{P } \frac{2}{3}$, what will 4 meters cost? $7\frac{1}{2}$ meters? Analyze.

3. At the rate of 3 for 5 centavos, how many bananas can I buy for 45 centavos? For $\text{P } 1\frac{1}{4}$?

4. A can do a piece of work in 3 days, and B can do it in 5 days. What part of the work can each do in a day? What part of it can they do in a day if they work together?

5. A boy bought oranges at the rate of 4 for 5 centavos, and sold them at the rate of 6 for 10 centavos. How much did he gain on each orange?

6. A man owning $\frac{2}{3}$ of a sugar mill sold $\frac{1}{3}$ of his share for $\text{P } 2400$. What was the value of the mill? Analyze.

7. If a man pays $\text{P } 300$ a year for the rent of a house, how much rent should he pay for $8\frac{1}{2}$ months?

8. If it takes $2\frac{1}{2}$ meters of cloth to make a coat and $2\frac{3}{4}$ meters to make a pair of trousers, how many suits can be made from $62\frac{3}{4}$ meters of cloth? Analyze.

9. Pedro spent $\frac{2}{3}$ of his money and had $\text{P } 3.50$ left. How much had he at first? Analyze.

10. A hardware dealer bought 6 axes at $\text{P } 2\frac{1}{10}$ each, 12 hammers at $\text{P } 1\frac{1}{2}$ each, 10 saws at $\text{P } 1\frac{3}{4}$ each, 24 hoes at $\text{P } 1\frac{1}{10}$ each, and 15 rakes at $\text{P } \frac{3}{4}$ each. What was the total cost?

11. If 24 kilos of fish cost $\text{P } 16\frac{1}{2}$, what will 9 kilos cost?

12. A man sold a horse for $\text{P } 105$ which was $\frac{7}{8}$ of its cost. What was the cost? What was the gain? Analyze.

13. If $\frac{1}{3}$ of a kilo of butter costs $\text{P } 1.20$, what will $4\frac{3}{8}$ kilos cost? Analyze.

DECIMALS

46. Oral.

A **decimal fraction**, or **decimal**, is a fraction whose denominator is 10, 100, 1000, 10,000, etc.

The denominator of a decimal is not written, but is shown by the position of the decimal point. Thus, $.4 = \frac{4}{10}$, $.005 = \frac{5}{1000}$.

The **decimal point** is the period placed before a decimal.

Decimal places are the places at the right of the decimal point.

1. Give the place value of each figure in 423,867,563792.

To read a decimal, read it as a whole number and give it the denomination of the right-hand figure.

In reading a number containing a whole number and a decimal, the word *and* should separate the whole number and the decimal part.

9,346,285.426536 is read, 9 million 346 thousand 285 *and* 426 thousand, 536 millionths.

Read the following:

2. .8	9. 9.8080	16. 5.2525	23. 1.960752
3. .09	10. 3.4275	17. 243.145	24. 25.00037
4. .009	11. 7.0042	18. .007205	25. 89.00400
5. .125	12. 22.2222	19. 23.0303	26. 400.00004
6. 6.075	13. 10.0005	20. 10.0762	27. 9.896753
7. 9.401	14. 5.8070	21. 208.0009	28. 8.506506
8. 10.07	15. 45.0025	22. 165.0657	29. 6.010407

47. Written.

75 thousandths written as a decimal is .075.

Since the right-hand figure, 5, must stand in thousandths' place, we write 5 in thousandths' place, 7 in hundredths' place, and a cipher in tenths' place.

Write in decimal form :

1. $\frac{45}{100}$; $\frac{8}{100}$; $\frac{423}{1000}$; $\frac{14}{1000}$; $\frac{7}{1000}$; $\frac{8678}{100000}$; $\frac{467}{100000}$; $\frac{40007}{1000000}$;
2. $43\frac{6}{10000}$; $39\frac{39}{10000}$; $42\frac{870}{10000}$; $7\frac{19672}{100000}$; $18\frac{384}{100000}$.
3. 9 and 33 hundredths; 427 ten-thousandths.
4. 82 and 4 thousandths; 318 and 25 thousandths.
5. 608 and 5 hundred-thousandths; 8 and 827 millionths.
6. Seven and four ten-thousandths; eight hundred two and nine hundred twelve hundred-thousandths.
7. Three million, eighty-four thousand, six hundred and seven hundred eleven millionths.
8. Nine hundred two thousand and four hundred six thousandths; one thousand sixty-nine millionths.

REDUCTION OF DECIMALS

48. Written.

Change .35 to a common fraction. $.35 = \frac{35}{100} = \frac{7}{20}$

To change a decimal to a common fraction, write the denominator of the decimal and reduce the fraction to lowest terms.

Change to common fractions in their lowest terms :

- | | | | |
|---------|----------|------------|------------|
| 1. .8 | 5. .875 | 9. .0625 | 13. .00005 |
| 2. .25 | 6. .025 | 10. .00175 | 14. .00015 |
| 3. .85 | 7. .055 | 11. .00025 | 15. .0350 |
| 4. .125 | 8. .0025 | 12. .00075 | 16. .02500 |

Change $.16\frac{2}{3}$ to a common fraction.

$$.16\frac{2}{3} = \frac{16\frac{2}{3}}{100} = \frac{\frac{50}{3}}{100} = \frac{50}{300} = \frac{1}{6}$$

- | | | | | |
|----------------------|----------------------|----------------------|-----------------------|-----------------------|
| 17. $.12\frac{1}{2}$ | 20. $.62\frac{1}{2}$ | 23. $.06\frac{1}{2}$ | 26. $.11\frac{1}{2}$ | 29. $1.12\frac{1}{2}$ |
| 18. $.37\frac{1}{2}$ | 21. $.87\frac{1}{2}$ | 24. $.18\frac{1}{2}$ | 27. $.14\frac{1}{2}$ | 30. $3.08\frac{1}{2}$ |
| 19. $.35\frac{1}{2}$ | 22. $.66\frac{1}{2}$ | 25. $.31\frac{1}{2}$ | 28. $.012\frac{1}{2}$ | 31. $9.05\frac{1}{2}$ |

Since $\frac{3}{10} = \frac{30}{100} = \frac{300}{1000}$, then $.3 = .30 = .300$.

Ciphers may be placed at the right of a decimal without changing its value; also ciphers may be removed from the right of a decimal without changing its value.

Change $\frac{3}{8}$ to a decimal. $8 \overline{)3.000}$
 $\underline{.375}$

To change a common fraction to a decimal, annex ciphers to the numerator, divide by the denominator, and from the right of the quotient point off as many decimal places as there are ciphers annexed.

Change to decimals:

32. $\frac{1}{6}$	37. $\frac{5}{26}$	42. $2\frac{3}{20}$	47. $\frac{1}{8}$	52. $\frac{5}{12}$
33. $\frac{3}{4}$	38. $\frac{11}{20}$	43. $5\frac{4}{80}$	48. $\frac{1}{6}$	53. $\frac{5}{9}$
34. $\frac{7}{20}$	39. $\frac{25}{40}$	44. $8\frac{2}{25}$	49. $\frac{2}{3}$	54. $\frac{8}{15}$
35. $\frac{1}{8}$	40. $\frac{7}{8}$	45. $11\frac{7}{50}$	50. $\frac{5}{6}$	55. $\frac{16}{25}$
36. $\frac{5}{8}$	41. $\frac{10}{16}$	46. $6\frac{9}{40}$	51. $\frac{3}{8}$	56. $\frac{7}{80}$

ADDITION AND SUBTRACTION OF DECIMALS

49. Written.

To add or subtract decimals, write the numbers so that the decimal points stand in a column. Add or subtract as in simple numbers and place the point in the result directly under the points above.

Add:

1. 14.607, 23.75, 342.125, 78.063, 167.4, .689
2. 67.18, 135.071, 382.8, 98.63, .6758, 43.072
3. 3.465, 1073.2, 42.009, 624.35, 8.0167, .9835
4. 10.672, 309.42, 4.6307, 34.808, 2.635, 426.8
5. 400.75, 125.125, 43.706, 127.9, 863.42, 4.1681

6. ₱125.25, ₱48.75, ₱16.88, ₱83.65, ₱128.80
 7. ₱283.16½, ₱53.33½, ₱41.12½, ₱9.46, ₱316.37½
 8. ₱4.44, ₱82.16½, ₱11.75, ₱122.14½, ₱67.72
 9. ₱75, ₱22.66½, ₱133.13½, ₱107.08½, ₱212.12½
 10. \$255.50, \$482, \$29.75, \$10.83½, \$66.66½
 11. \$140.75, \$67.55½, \$9.35, \$12.12½, \$463

Subtract:

- | | | | |
|------------------------------|------------------------------|------------------------------|----------------------------|
| 12. ₱445.35
<u>162.75</u> | 13. ₱503.62
<u>228.38</u> | 14. ₱752.16
<u>436.28</u> | 15. ₱54.00
<u>17.75</u> |
| 16. 85.327
<u>27.46</u> | 17. 42.68
<u>25.372</u> | 18. 343.4
<u>78.244</u> | 19. 85.
<u>7.6254</u> |
| 20. 35.4 - 16.75 | 23. 208 - 4.372 | 26. 21.1 - 12.007 | |
| 21. 84 - 35.63 | 24. 375 - 25.87 | 27. 200 - 9.008 | |
| 22. 72.35 - 8.8 | 25. 15 - 8.1246 | 28. 403 - 72.8021 | |

Find the value of:

29. $37.5 + 125.85 - 62.073 + 40.407 - 55.6722$
 30. $27.32 - 10.075 + 207.756 + 80.142 - 121.216$
 31. $4.068 + 400.8 - 109.73 - 87.042 + 32.46$
 32. $69.707 - 24.175 - 17.04 + 65.134 - 10.009$
 33. ₱75.65 + ₱43 - ₱37.57 - ₱18.25 + ₱74.10 - ₱.85 - ₱46
 34. ₱25.12½ + ₱62.37½ - ₱16.80 - ₱9.67 + ₱25.45 - ₱4.82
 35. \$8.66½ + \$75.33½ - \$10.37½ - \$12.62½ + \$85.40 - \$15
 36. I had ₱20. I bought a hat for ₱3.75, shoes for ₱5.50, and shirts for ₱7.60. How much money had I left?
 37. Luis put into the Postal Savings Bank ₱4.50, ₱3.75, ₱5.25, ₱3.80, and ₱2.70. He drew out ₱3.25, ₱4.10, and ₱5.60. How much money had he still in the bank?

MULTIPLICATION OF DECIMALS

50. Written.

$$3.5 \times 4.252 = ?$$

$$\begin{array}{r} 4.252 \\ 3.5 \\ \hline 21260 \\ 12756 \\ \hline 14.8820 \end{array}$$

To multiply one decimal by another, multiply as in whole numbers, and from the right of the product point off as many decimal places as there are in both multiplicand and multiplier.

Prefix ciphers if necessary to make the right number of decimal places in the product. Ciphers at the right of the decimal have no value and may be canceled.

Multiply:

- | | | |
|-----------------|--------------------------------|---------------------------------|
| 1. 24.63 by .7 | 9. 607 by $.37\frac{1}{2}$ | 17. 9.008 by $.073\frac{1}{2}$ |
| 2. 18.5 by .04 | 10. 4.88 by $2.16\frac{1}{2}$ | 18. .3023 by 115 |
| 3. 209 by .75 | 11. 30.9 by .025 | 19. 3200 by $.006\frac{1}{2}$ |
| 4. 8.27 by 4.5 | 12. .0756 by $46\frac{1}{2}$ | 20. .3116 by .0215 |
| 5. .565 by .64 | 13. 4.026 by $4.33\frac{1}{2}$ | 21. .0075 by $1.033\frac{1}{2}$ |
| 6. .227 by .08 | 14. 27.116 by $26\frac{1}{2}$ | 22. 8000 by $.007\frac{1}{2}$ |
| 7. 4.43 by 2.07 | 15. 2.175 by $1.06\frac{3}{4}$ | 23. $.0025\frac{1}{2}$ by .0016 |
| 8. 2.06 by .325 | 16. 6400 by $.37\frac{1}{2}$ | 24. .0008 by $1.007\frac{1}{2}$ |

25. What will 8.5 dozen oranges cost at ₱.42 a dozen?

26. I paid ₱5.87 $\frac{1}{2}$ a quintal for 122.8 quintals of sugar, and sold it for ₱6.45 a quintal. How much did I gain?

27. There are 39.37 inches in a meter. How many inches are there in 2.4 meters? In 5.8 meters?

28. Find the cost of 8.5 kilos of meat at ₱.88 a kilo, and 4.8 kilos of butter at ₱1.85 a kilo.

29. At ₱87.50 a hektar, what will 22.44 hektars of land cost?

30. At the rate of 42.75 kilometers an hour, how far will a train run in 8.5 hours? In 12.6 hours?

51. Oral.

$10 \times .2865 = 2.865$

$1000 \times .2865 = 286.5$

To multiply a number by 10, 100, 1000, etc., move the decimal point as many places to the right as there are ciphers in the multiplier. Annex ciphers if necessary.

1. $10 \times .046$

6. 1000×24.67

11. 100×4.56

2. 100×1.007

7. $1000 \times .0051$

12. $1000 \times .0043$

3. 100×2.64

8. 1000×10.06

13. 1000×47.8

4. $100 \times .0092$

9. 1000×5.431

14. $1000 \times .0021$

5. 100×36.4

10. 1000×4.6

15. $1000 \times .0007$

USEFUL PARTS OF A PESO**52. Oral.**

Commit to memory the following:

$.20 = \frac{1}{5}$	$.10 = \frac{1}{10}$	$.12\frac{1}{2} = \frac{1}{8}$	$.75 = \frac{3}{4}$	$.16\frac{2}{3} = \frac{1}{6}$
$.40 = \frac{2}{5}$	$.30 = \frac{3}{10}$	$.25 = \frac{1}{4}$	$.87\frac{1}{2} = \frac{7}{8}$	$.33\frac{1}{3} = \frac{1}{3}$
$.60 = \frac{3}{5}$	$.70 = \frac{7}{10}$	$.37\frac{1}{2} = \frac{3}{8}$	$1.12\frac{1}{2} = \frac{9}{8}$	$.66\frac{2}{3} = \frac{2}{3}$
$.80 = \frac{4}{5}$	$.90 = \frac{9}{10}$	$.50 = \frac{1}{2}$	$1.25 = \frac{5}{4}$	$.83\frac{1}{3} = \frac{5}{6}$
$1.20 = \frac{6}{5}$	$1.10 = \frac{11}{10}$	$.62\frac{1}{2} = \frac{5}{8}$	$1.37\frac{1}{2} = \frac{11}{8}$	$1.33\frac{1}{3} = \frac{4}{3}$

1. How many hundredths of a peso is $\frac{1}{2}$ of a peso? $\text{P } \frac{1}{4}$? $\text{P } \frac{3}{4}$? $\text{P } \frac{1}{5}$? $\text{P } \frac{2}{5}$? $\text{P } \frac{1}{10}$? $\text{P } \frac{3}{10}$? $\text{P } \frac{1}{8}$? $\text{P } \frac{3}{8}$? $\text{P } \frac{1}{6}$? $\text{P } \frac{5}{6}$? $\text{P } \frac{1}{3}$?

2. What fractional part of a peso is 50 centavos? $\text{P } .20$? $\text{P } .30$? $\text{P } .25$? $\text{P } .40$? $\text{P } .80$? $\text{P } .75$? $\text{P } .33\frac{1}{3}$? $\text{P } .12\frac{1}{2}$?

3. Find the cost of 50 articles at $\text{P } .50$ each; at $\text{P } .20$ each; at $\text{P } .40$ each; at $\text{P } .30$ each; at $\text{P } .80$ each; at $\text{P } 1.20$ each.

4. Find the cost of 24 articles at $\text{P } .33\frac{1}{3}$ each; at $\text{P } .66\frac{2}{3}$ each; at $\text{P } .12\frac{1}{2}$ each; at $\text{P } .37\frac{1}{2}$ each; at $\text{P } .62\frac{1}{2}$ each; at $\text{P } 1.12\frac{1}{2}$ each.

5. Find the cost of 36 meters of cloth at $\text{P } .16\frac{2}{3}$ a meter; at $\text{P } 1.33\frac{1}{3}$; at $\text{P } 1.66\frac{2}{3}$; at $\text{P } .83\frac{1}{3}$; at $\text{P } 1.16\frac{2}{3}$; at $\text{P } 2.33\frac{1}{3}$.

6. Find the cost of 60 articles at $\text{P } .40$ each; at $\text{P } .70$ each; at $\text{P } .90$ each; at $\text{P } 1.10$ each; at $\text{P } 1.33\frac{1}{3}$ each.

DIVISION OF DECIMALS

53. Written.

The dividend is the product of the divisor and the quotient, and there are as many decimal places in the dividend as there are in both the divisor and the quotient. Therefore, to find the number of decimal places in the quotient, find the difference between the number of places in the dividend and the number in the divisor. Then point off in the quotient the same number of places as the difference.

$$\begin{array}{r} 5.3 \\ .45 \overline{) 2.385} \\ \underline{2 \ 25} \\ 135 \\ \underline{135} \end{array}$$

Divide 2.385 by .45.

There are three decimal places in the dividend and two in the divisor. The difference is one. Therefore one place is pointed off in the quotient.

- | | | |
|--------------------|----------------------|----------------------|
| 1. $96.35 + 41$ | 11. $285.516 + 462$ | 21. $929.5 + 338$ |
| 2. $8.825 + 25$ | 12. $833 + 1225$ | 22. $4.62 + .09$ |
| 3. $508.875 + 125$ | 13. $21.5 + .086$ | 23. $.18989 + .17$ |
| 4. $7.584 + .24$ | 14. $.53972 + .0131$ | 24. $64.63 + 1405$ |
| 5. $1.164 + .08$ | 15. $322.5 + .129$ | 25. $.451881 + 3.33$ |
| 6. $685.3 + .55$ | 16. $.35028 + .042$ | 26. $.246855 + .07$ |
| 7. $11.476 + .38$ | 17. $.2125 + 12.5$ | 27. $.02875 + 25$ |
| 8. $54.131 + 1.33$ | 18. $47.905 + .1474$ | 28. $100.75 + 310$ |
| 9. $1064 + 3.2$ | 19. $47,925 + .213$ | 29. $1.0075 + .31$ |
| 10. $5 + 6.25$ | 20. $.005 + .08$ | 30. $.010075 + .31$ |

54. Written.

1. How many 75-centavo knives can I buy for ₱ 63?

At ₱ .75, or ₱ $\frac{3}{4}$, each, I can buy as many knives for ₱ 63 as ₱ $\frac{4}{3}$ is contained times in ₱ 63, or 84 times; hence, 84 knives.

2. How many $12\frac{1}{2}$ -centavo pictures can be bought for ₱ 14.50?

3. How many $37\frac{1}{2}$ -centavo books can be bought for ₱ 11.62 $\frac{1}{2}$?

4. How many rakes at ₱.87½ each can be bought for ₱231?
5. At ₱1.12½ a meter, how many meters of cloth can be bought for ₱27? For ₱126?
6. At ₱1.33½ a kilo, how many kilos of butter can be bought for ₱84? For ₱126.66½?
7. At ₱1.75 each, how many chairs can I buy for ₱28?
8. At ₱2.25 a piece, how many pieces of iron roofing can be bought for ₱74.25? For ₱213.75?
9. At ₱2.50 each, how many umbrellas can be bought for ₱92.50? For ₱117.50?

55. Oral.

$$35 \div 10 = 3.5$$

$$35 \div 100 = .35$$

$$35 \div 1000 = .035$$

To divide a number by 10, 100, 1000, etc., move the decimal point as many places to the left as there are ciphers in the divisor. Prefix ciphers if necessary.

Divide:

1. By 10: 75; 4.25; 30.8; 500; .721; 25.32; 620; 2.041.
2. By 100: 342; 41.63; 470; 731.6; 1042; 2.5; 44.23.
3. By 1000: 4083; 167.25; 3467.2; 27.41; 46.25.
4. By 10,000: 2503; 3467.1; 47; 122.56; 3040.

56. Oral.

REVIEW OF DECIMALS

1. At ₱.20 a liter, how many liters of oil can I buy for ₱2.40?
2. If I exchange 10 dozen eggs at ₱.45 a dozen for cloth at ₱.50 a meter, how many meters of cloth will I get? Analyze.
3. What must I pay for 4 dozen lemons at ₱1.10 a dozen, and 2 dozen oranges at ₱.60 a dozen?
4. If 8 pineapples cost ₱.72, what will 5 pineapples cost at the same rate? Analyze.
5. Find the cost of 20 4-centavo and 40 2-centavo stamps.

6. I had 2 20-peso bills. I paid ₱9 for a suit of clothes, ₱6 for a pair of shoes, ₱3 for a hat, and ₱4.50 for some shirts. How much change did I receive?

7. If the rice crop on 5 hektars is 277.5 cavanese, what is the average yield per hektar?

8. A man has 4.25 hektars of coconut trees averaging 200 trees to the hektar, and 2.5 hektars averaging 150 trees to the hektar. How many coconut trees has he?

9. $256.38 \div 10 = ?$ $3584.6 \div 100 = ?$ $428.57 \div 1000 = ?$

57. Written.

1. How much will it cost to drill a well 264.8 feet deep at ₱1.37½ a foot?

2. If 15 quintals of copra sell for ₱101.25, what will 6.4 quintals sell for at the same rate? Analyze.

3. A grocer bought a 75-liter keg of vinegar for ₱26.25. How much did it cost per liter?

4. What must I pay for 4.5 dozen eggs at ₱.42 a dozen, 3.2 kilos of coffee at ₱1.10 a kilo, and 2.4 kilos of butter at ₱1.85 a kilo?

5. A man paid ₱990 for 12 hektars of land. At that rate, what will 5.2 hektars cost? Analyze.

6. At ₱1.75 each, how many bamboo chairs can be bought for ₱31.50? For ₱78.75? Analyze.

7. At ₱42.50 a hundred, how many buri hats can I buy for ₱153?

8. A farmer exchanged 30 cavanese of maize at ₱1.80 a cavan for rice at ₱3.75 a cavan. How many cavanese of rice did he receive? Analyze.

9. If a train runs 108.9 kilometers in 2.25 hours, what is its rate per hour?

10. A woodcutter sold some wood at ₱1.95 a cubic meter. If he received ₱24.18 for it, how many cubic meters did he sell?

11. If a man can travel 90 kilometers in 2.4 days, how far can he travel in 5.2 days? Analyze.

12. A grocer bought 9 sacks of coffee containing 27.5 kilos each for ₱14.50 a sack, and sold it at ₱.72 a kilo. How much did he gain?

13. If 3.5 tons of coal cost ₱45.50, how many tons can I buy for ₱62.40 at the same rate? Analyze.

14. At ₱87.50 per hektar, what will 7.28 hektars of land cost? 12.36 hektars? 16.96 hektars?

15. In 1 mile there are 1.6093 kilometers. How many kilometers are there in 6.4 miles?

16. A fruit dealer bought 7 boxes of oranges containing 126 oranges each, at ₱8.40 a box. For how much a dozen must he sell them to gain ₱22.05?

17. A merchant bought 110 crates of potatoes for ₱3.50 a crate. He sold .7 of them at ₱3.90 a crate and the remainder at ₱3.75 a crate. How much did he gain?

18. A grocer bought 125 kilos of nuts at ₱.35 a kilo. For how much a kilo must he sell them to gain ₱18.75? Analyze.

19. How much will it cost to build a fence around a rectangular lot 143.8 meters long and 96.6 meters wide, at ₱.37½ a meter?

20. At the rate of 3.2 meters of silk for ₱12, how many meters can I buy for ₱33? Analyze.

21. If 20 men can do a piece of work in 6.5 days, how long will it take 25 men to do the work? Analyze.

22. A man earns ₱15.50 a week. If his expenses average ₱9.75 a week, how long will it take him to save enough money to buy a horse valued at ₱184?

58. Written.

1. $25.046 + 132.75 + .00421 + 36.009 + 4236 + 7.3901$
2. $1.00243 + 6635.4 + 827 + .0096 + .24 + 2682.41$
3. $6954.3 + 18.0025 + .7321 + 123.79 + 8427 + 3081.6$
4. $.9327 + 1024.5 + 60.007 + 382 + 563.9 + 1.00004$
5. $6392.4 + 8.294 + .10256 + 32,000 + 43.628 + 901$
6. $829.47 + 38.009 + 5.2736 + 5240 + 567.3809$
7. $3692.74 + 52.0007 + 8319.92 + 25,466.7 + 888.888$
8. $92.6004 + 2307.61 + .0045 + .002936 + .254683$
9. $726.54 - 138.007$
10. $4800.013 - 2754.23$
11. $120,000 - 59.024$
12. $.04 - .003246$
13. $7.007 - .45638$
14. $91.192 - 4.36827$
15. $450 - 12.0045$
16. $3800 - .0038$
17. $2635.104 - 887.0027$
18. $3601.2 - 148.0924$
19. $25.0025 - 2.50025$
20. $7.9368 - .28975$
21. $400.004 - 4.44$
22. $25,400 - 36.9724$

Multiply:

- | | | |
|-------------------------------|-------------------------------|--------------------------------|
| 23. 428 by $.12\frac{1}{2}$ | 28. 2.354 by 1.27 | 33. 842.4 by 1.12 |
| 24. 654 by $.37\frac{1}{2}$ | 29. .3005 by $9.8\frac{1}{2}$ | 34. 26.85 by $1.33\frac{1}{2}$ |
| 25. 5464 by .75 | 30. 8436 by $.62\frac{1}{2}$ | 35. 335.6 by 2.25 |
| 26. 838.2 by $.33\frac{1}{2}$ | 31. 508.4 by $.87\frac{1}{2}$ | 36. .0049 by 3560 |
| 27. 467.4 by $.66\frac{2}{3}$ | 32. 4842 by 1.25 | 37. 4.084 by 175 |

Divide:

- | | | |
|-------------------------------|--------------------------------|-----------------------------------|
| 38. 85 by $.62\frac{1}{2}$ | 43. 363 by $1.37\frac{1}{2}$ | 48. ₱82.80 by ₱ $.37\frac{1}{2}$ |
| 39. 216 by $1.12\frac{1}{2}$ | 44. 84.6 by 2.25 | 49. ₱97.50 by ₱.75 |
| 40. 385 by $.87\frac{1}{2}$ | 45. 9.59 by 1.75 | 50. ₱43.20 by ₱ $1.12\frac{1}{2}$ |
| 41. 96.5 by 1.25 | 46. 478.8 by $1.12\frac{1}{2}$ | 51. ₱25.25 by ₱ $1.16\frac{3}{4}$ |
| 42. 92.4 by $1.33\frac{1}{3}$ | 47. 37.55 by 2.50 | 52. ₱75.75 by ₱ $.83\frac{1}{3}$ |

BILLS AND ACCOUNTS

59. Written.

A man's **debt** is the amount he owes.

A man's **credit** is the amount due him; also the amount he pays on a debt.



The man who owes is a **debtor**.
The man to whom a debt is due is a **creditor**.

An **account** is a record of debts and credits, cash paid or received, or services rendered.

A **bill** is a written statement of a debtor's account.

A creditor **receipts** a bill by writing "Received payment" across the foot of the bill, and signing his name.

RECEIPTED BILL

MANILA, OCT. 30, 1909

Mr. Hugo Lopez.

Bought of J. C. JOHNSON & Co.

Oct.	4	8½ kilos sugar, @ ₱.30	₱ 2 55
	9	2½ kilos cheese, @ ₱.80	1 76
	19	4 liters vinegar, @ ₱.35	1 40
	24	12 cans milk, @ ₱.28	3 36
	28	2½ kilos tea, @ ₱ 2.20	5 50
			₱ 14 57
Received Payment,			
J. C. JOHNSON & Co.			

Have the pupils use local prices to make out receipted bills for groceries; for dry goods; for hardware; for books; for furniture; for labor; a tailor's bill.

Make out and receipt the following bills:

1. Mr. Manuel Luna bought of F. C. Javier: 2 dozen plates at ₱4.80 a dozen; $1\frac{1}{2}$ dozen cups at ₱3.60 a dozen; $1\frac{1}{2}$ dozen saucers at ₱2.40 a dozen; $1\frac{1}{2}$ dozen forks at ₱.80 a dozen.

2. Manila, Oct. 14, 1909. Mr. C. C. Smith bought of the American Hardware Co.: 7 baseball gloves at ₱4.50 each; 2 mits at ₱12.25 each; 6 bats at ₱1.12 $\frac{1}{2}$ each; and 6 baseballs at ₱2.83 $\frac{1}{2}$ each.

3. Iloilo, Oct. 7, 1909. Mrs. J. C. Martin bought of Hoskyn & Co.: 6 cans of corn at ₱.40 a can; 16 $\frac{1}{2}$ kilos of ham at ₱1.30 a kilo; 2 $\frac{1}{2}$ dozen lemons at ₱1.10 a dozen; 8 cans of peaches at ₱.55 a can.

4. Manila, Oct. 21, 1909. Mr. Alberto Reyes bought of E. C. McCullough & Co.: 8 dozen lead pencils at ₱1.12 $\frac{1}{2}$ a dozen; 32 readers at ₱.62 $\frac{1}{2}$ each; 48 arithmetics at ₱.37 $\frac{1}{2}$ each; 42 slates at ₱.33 $\frac{1}{2}$ each; 1 dictionary at ₱12.50.

5. Cebu, July 7, 1909. Mrs. Brown in account with Miss Consuelo Garcia: 8 days' work at ₱.75 per day; 5 spools of thread at ₱.15 per spool; 3 bolts of tape at ₱.12 per bolt; 4 yd. of lining silk at ₱.50 per yard.

Using your own name and that of some merchant whom you know, make out and receipt the following:

6. 4 $\frac{1}{2}$ Kg of beefsteak at ₱1.50 a Kg; 14 $\frac{1}{2}$ Kg of bacon at ₱1.10 a Kg; 4 $\frac{3}{4}$ Kg of butter at ₱1.75 a Kg; 3 chickens at ₱.85 each.

7. 8 $\frac{1}{2}$ meters of table-cloth linen at ₱.70 a meter; 3 oil lamps at ₱3.50 each; 1 coffee pot at ₱4.50; 2 $\frac{1}{2}$ dozen napkins at ₱2.80 a dozen; 1 ice-cream freezer at ₱7.75.

8. 2 $\frac{3}{4}$ tons of coal at ₱14.80 a ton; 2 $\frac{3}{10}$ cubic meters of wood at ₱2.40 a cubic meter; 8 kilos of oats at ₱.02 $\frac{1}{2}$ a kilo; 8 $\frac{3}{4}$ cavanos of maize at ₱1.75 a cavan.

60. Written.**CASH ACCOUNT**

1909			RECEIPTS	PAYMENTS
Aug.	4	Amount on hand	₱ 275 75	
	5	Received for labor	48 50	
	7	Paid for groceries		₱ 10 85
	9	Paid for clothes		15 50
	12	Received for rice sold	13 50	
	18	Paid for furniture		11 25
		Balance on hand		300 15
			₱ 337 75	₱ 337 75

Write out the following accounts and find the balance in each :

1. Oct. 1, 1909, amount of cash on hand, ₱ 67.75; Oct. 8, paid for a suit of clothes, ₱ 8.50, paid for a hat, ₱ 3.75; Oct. 9, paid for groceries, ₱ 14.50; Oct. 14, received for labor, ₱ 32.50; Oct. 17, paid for tools, ₱ 7.80; Oct. 21, paid for rent, ₱ 15.50.

2. A farmer's account. Nov. 1, 1909, amount on hand, ₱ 74.80; Nov. 4, paid for labor, ₱ 15.50; Nov. 6, received for maize, ₱ 25.50; Nov. 8, paid for groceries, ₱ 7.60; Nov. 11, paid for books, ₱ 2.75; Nov. 13, received for chickens, ₱ 12.40; Nov. 25, paid for cloth, ₱ 3.80; Nov. 28, received for eggs, ₱ 5.80.

3. A boy's account. Sept. 1, amount on hand, ₱ 12.50; Sept. 3, put into the Postal Savings Bank, ₱ 10; Sept. 9, received for work, ₱ 4.50; Sept. 12, paid for a knife, ₱ 1.40; Sept. 16, paid for a hat, ₱ 1.80; Sept. 23, received for work, ₱ 4.50; Sept. 24, put into the Postal Savings Bank, ₱ 5; Sept. 28, paid for books, ₱ 2.40. (Count the money put in the Bank as paid out.)

4. Write out four cash accounts of your own and find the balance in each.

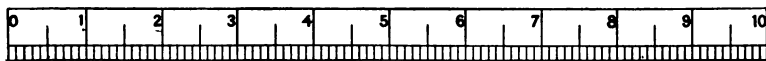
METRIC SYSTEM

61. Oral.

The **metric system** is a decimal system of weights and measures which originated in France about 1800. It is now used in nearly all civilized countries, except England and the United States, and is the official system in the Philippines.

All the units of this system are derived from the **primary unit**, the **meter**, which is about one ten-millionth of the distance from the equator to the pole.

METRIC MEASURES OF LENGTH



1 decimeter = 10 centimeters = 100 millimeters

62. Oral.

Table of Length

PREFIX	MEANS	
milli-	.001	A <i>millimeter</i> (mm) = .001 of a meter
centi-	.01	A <i>centimeter</i> (cm) = .01 of a meter
deci-	.1	A <i>decimeter</i> (dm) = .1 of a meter
	1	A <i>meter</i> (m) = 1 meter
deka-	10	A <i>dekameter</i> (Dm) = 10 meters
hekto-	100	A <i>hektometer</i> (Hm) = 100 meters
kilo-	1000	A <i>kilometer</i> (Km) = 1000 meters
myria-	10000	A <i>myriameter</i> (Mm) = 10000 meters

The above prefixes are used in all the metric tables and should be thoroughly learned. The units most commonly used are in italics.

10 <i>millimeters</i>	= 1 <i>centimeter</i>
10 <i>centimeters</i>	= 1 <i>decimeter</i>
10 <i>decimeters</i>	= 1 <i>meter</i>
10 <i>meters</i>	= 1 <i>dekameter</i>
10 <i>dekameters</i>	= 1 <i>hektometer</i>
10 <i>hektometers</i>	= 1 <i>kilometer</i>
10 <i>kilometers</i>	= 1 <i>myriameter</i>

If the school is not provided with meter sticks, let each pupil make his own meter stick from a strip of bamboo, marking it off into centimeters and decimeters with the diagram on page 47 as a guide. Give the pupils a great deal of practice in estimating and measuring lengths in the schoolroom and on the school grounds.

1. Give the meaning of *centi-*, *milli-*, *deci-*, *kilo-*, *hekto-*.
2. How many centimeters in 1 meter? In 4 meters? In 8 meters? In 15 meters? In 24.3 meters? In $12\frac{1}{2}$ meters?
3. How many decimeters in 50 centimeters? In 400 centimeters? In 125 centimeters? In 638 centimeters?
4. In 8.5 meters there are how many centimeters? How many decimeters? How many millimeters?
5. How many meters in 2 kilometers? In 22 kilometers? In 2.5 kilometers? In 42.4 kilometers?
6. Give the prefix which means: .1, 10, .01, 100, .001, 1000.

63. Written.

Change 4.2154 kilometers to centimeters.

$$4.2154 \text{ Km} = 4215.4 \text{ m} = 421,540 \text{ cm}$$

Change 241,360 centimeters to kilometers.

$$241,360 \text{ cm} = 2413.6 \text{ m} = 2.4136 \text{ Km}$$

Since the multipliers in all metric tables are 10, 100, or 1000, reductions are made by simply moving the decimal point to the right or left.

To change from one metric unit to another, first move the decimal point so as to change the given measure into terms of the principal unit; then move the point again so as to change from the principal unit into terms of the unit desired.

1. Change to meters: 625 cm; 965 cm; 64 dm; 5575 mm.
2. Change to centimeters: 863.5 mm; 763 dm; 6.07 dm.
3. Change to meters: 4.4 Km; 32.75 Km; 64.5 dm; 4.5 cm.
4. Change to meters: .075 Km; .645 dm; 4.036 Km.
5. Change 46.5 m to cm; to mm; to Km; to dm.
6. Change 6425 cm to m; to Km; to dm; to mm.

7. Change 42.0763 Km to m; to cm; to Hm; to dm.
8. Change to centimeters: 46.52 m; 64.3 dm; .0125 Km.
9. Change to kilometers; 76,050 dm; 768,500 cm.
10. Change 1,042,756 mm to cm; to dm; to m; to Dm.
11. Change .046358 Km to m; to cm; to dm; to mm.
12. Write as meters: 4 Km and 4 m; 14.5 Km and 3.5 m; 1.6 Km and 68 dm; .62 Km and 425 cm.
13. Write in one number as meters: 42 Km, 6 Hm, 5 Dm, 2 m, 8 dm, and 7 cm.

Write the following as meters :

14. 200 cm; 4.55 cm; 1670 dm; 17.568 mm; 4768 cm.
15. .768 Km; 30.05 Dm; 147.55 cm; 114.65 dm.
16. .00125 Km; 8.25 dm; .673 Hm; 46,750 mm; 437.56 cm.

Quantities which are to be added or subtracted must be written in the same unit of measure.

Write as meters and add :

17. 46.5 cm; .0125 Km; 6750 mm; 75.05 dm; 425.25 m.
18. 5200 cm; 67,500 mm; 27.125 m; .00465 Km; 1675.6 cm.
19. 61.75 cm; 4.012 Km; 31.44 dm; .007 Km; 75.065 m.

Write as meters and find the value of :

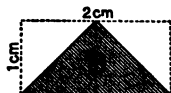
20. $146.75 \text{ m} + .0175 \text{ Km} - 5682.5 \text{ cm} - 34,700 \text{ mm}$.
21. $1.125 \text{ Km} - 7562 \text{ cm} + 67.43 \text{ dm} - 465.55 \text{ m} - 7640 \text{ mm}$.
22. $1 \text{ Km} - 647.55 \text{ m} - 4651.5 \text{ cm} - 84,000 \text{ mm} - .0152 \text{ Km}$.
23. $25 \times 25.4 \text{ cm}$; $6.8 \times .045 \text{ Km}$; $8.75 \times 2124 \text{ cm}$.
24. $4860 \text{ cm} \div 24$; $1.775 \text{ Km} \div 125$.
25. $4.75 \times 2448 \text{ cm}$; $.832 \times 1.125 \text{ Km}$.
26. $1638 \text{ cm} \div .375$; $2.405 \text{ Km} \div 6.5$.
27. $24.5 \text{ m} \div .098 \text{ Km}$; $155 \text{ cm} \div 2.48 \text{ m}$.
28. $1.863 \text{ Km} \div 324 \text{ cm}$; $2006 \text{ cm} \div .425 \text{ Km}$.

64. Written.

1. At ₱3.65 a meter, what will 22.5 m of silk cost?
2. From a piece of cloth containing 65.5 meters, 23.25 meters were sold. Find the value of the remainder at ₱.16 a meter.
3. Find the cost of building 265.5 kilometers of railroad at ₱4750 a kilometer.
4. What is the rate per hour when a train runs 31.5 Km in 36 minutes? Analyze.
5. Make out a bill for the following: 4.8 meters of lace at ₱.65 a meter; 16.5 meters of jusi at ₱1.20 a meter; 4.2 meters of silk fringe at ₱1.75 a meter; and 28 meters of ribbon at ₱.12½ a meter.
6. If a horse travels 37.4 Km in 4.4 hours, how far will he travel in 9.8 hours going at the same rate? Analyze.
7. Find the whole cost of 20.5 m of muslin at ₱.22 a m, 28.4 m of calico at ₱.18 a m, and 12.8 m of linen at ₱.90 a m.
8. A kilometer equals .6214 of a mile. How many kilometers are there in 59.033 miles?
9. If a man paid ₱18.75 for 25 meters of khaki, how many meters could he buy for ₱26.40 at the same rate?
10. Adela wove 168.6 m of jusi in January, 142.7 m in February, and 123.4 m in March. What was the average number of meters she wove per month?
11. Find the cost of fencing a lot $37\frac{1}{2}$ m long, and $25\frac{1}{2}$ m wide at ₱.08½ per meter.
12. A bale of abacá $1\frac{1}{4}$ m long, $\frac{3}{4}$ m wide, and $\frac{3}{4}$ m high is tied with bejuco. How many meters of bejuco does it take to pass three times around the bale the longest way, three times around the shortest way, and allow 1 m for tying?

METRIC MEASURES OF SURFACE

1 sq.cm									
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65. Oral.

Table of Surface Measure

100 square millimeters (sq. mm)	= 1 square centimeter (sq. cm)
100 square centimeters	= 1 square decimeter (sq. dm)
100 square decimeters	= 1 square meter (sq. m)
100 square meters	= 1 square dekameter (sq. Dm)
100 square dekameters	= 1 square hektometer (sq. Hm)
100 square hektometers	= 1 square kilometer (sq. Km)

Notice that in metric surface measure it requires 100 units of any denomination to make 1 unit of the next higher denomination.

- How many square millimeters are there in 1 square centimeter? In 64 sq. cm? In 4.5 sq. cm? In 2.25 sq. cm?
- How many square centimeters are there in 1 square decimeter? In 5.4 sq. dm? In 15.35 sq. dm? In .075 sq. dm?
- How many square decimeters are there in 1 square meter? In 8.5 sq. m? In 27.4 sq. m? In 8.75 sq. m? In .293 sq. m?
- How do you find the area of a rectangle?
- How many square centimeters are there in a rectangle 1 cm wide and 10 cm long? 4 cm by 10 cm? $4\frac{1}{2}$ cm by 10 cm?
- How many square meters are there in a floor 20 m long and $6\frac{1}{2}$ m wide? 12 m by $5\frac{1}{2}$ m? 12.4 m by 10 m?
- How do you find the area of a triangle?
- What is the area of triangle *A* above? Of *B*?

9. Give the area of a triangle whose base is 40 m ; height or altitude, 20 m. Base, 30 m ; altitude, 12 m. Base, 60 m ; altitude, 20 m.

10. How many square centimeters in a square 8 cm on each side? 20 cm on each side? 60 cm on each side?

11. Square 6. ($6 \times 6 = 36$) Square 8, 10, 12, 20, 30, 40, 50.

12. How long and wide is a square that contains 25 sq. cm? 36 sq. cm? 64 sq. m? 81 sq. m? 144 sq. m? 400 sq. m?

66. Written.

1. How many square centimeters are there in 1 square meter? In 8.6 sq. m? In 125.8 sq. m? In 40.675 sq. m?

2. Change to square meters: 6 sq. Km; 35.8 sq. Km.

3. Change 675 sq. m to sq. dm; 1.48576 sq. Km to sq. m.

4. Change 60,476.6 sq. cm to sq. dm; 4.2687 sq. m to sq. cm.

5. Change 46,870 sq. m to sq. Km; 6850 sq. cm to sq. m.

6. Find the area of a floor 82.5 dm long and 60 dm wide.

7. Find the cost of a town lot 64 m long and 37.5 m wide at ₱1.75 a square meter.

8. A rectangular mat containing 4800 sq. cm is 64 cm wide. How long is it?

9. How many tiles 20 cm by 20 cm are necessary to lay a floor 8.4 m long and 6.2 m wide? Analyze.

10. Find the area of a flower bed in the form of a triangle whose base is 240 cm and whose altitude is 84 cm.

11. How many bricks each 20 cm long and 10 cm wide will it take to build a walk 140 m long and 1.2 m wide? How much will the bricks cost at ₱16.50 a thousand?

12. Find the cost of painting the walls of your schoolroom at ₱.35 a sq. m.

Table of Land Measure

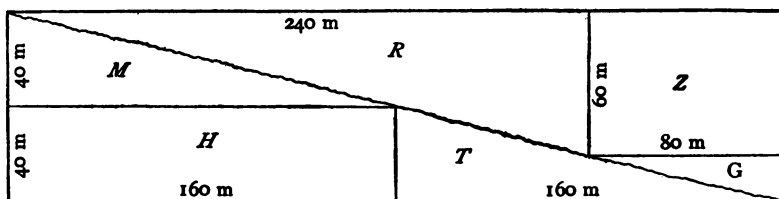
1 square meter	= 1 centar (ca)
100 square meters	= 1 ar (a)
100 ars	= 1 hektar (Ha)

67. Written.

- How many square meters are there in 145 ars? In 1 hektar? In .625 hektar? In 4.75 hektars? In .2755 hektar?
- How many hektars are there in 20,000 sq. m? In 14,500 sq. m? In 40,756 sq. m? In 435,678 sq. m?
- How many hektars are there in a rectangular piece of land 320 m by 162.5 m? 608.75 m by 560 m? 424.4 m by 137.5 m?
- Find the cost of a piece of land 96 m long and $62\frac{1}{2}$ m wide at ₱125.50 per hektar.
- I bought 1.125 Ha of land at ₱840 per Ha and sold it at ₱.22 per sq. m. How much did I gain?
- If 27.5 Ha of land cost ₱3410, what will 16.75 Ha cost?
- I paid ₱1218 for 7.25 Ha of land. At the same rate, how many Ha could I buy for ₱3780? Analyze.
- I divided a piece of land containing 12 Ha into 50 equal lots. How many sq. m were there in each lot?
- Mr. Hugo bought a piece of land 240 m long and 250 m wide for ₱375 a hektar. He divided it into building lots 20 m by 50 m which he sold at ₱72 each. How much did he gain?
- I bought a square piece of land 220 m by 220 m for ₱363. At the same rate, what will 16.5 Ha cost? Analyze.
- There are about 2.471 acres in 1 hektar. How many acres are there in 25 Ha? How many hektars are there in 91.427 acres?
- A rectangular piece of land containing 5 Ha is 125 m wide. How long is it?

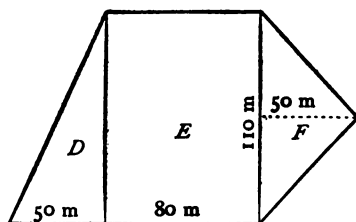
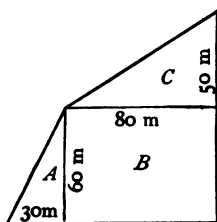
68. Written.

1. Mr. Torres has a rectangular farm 320 m long and 80 m wide. How many hektars of land has he?



2. The farm is divided into fields as shown in the diagram. How many hektars are planted in maize (*M*)? In hemp (*H*)? In tobacco (*T*)? In rice (*R*)? In zacate (*Z*)? In the garden (*G*)?

3. Find the area of the farm by adding the six areas, and compare with the area as found in No. 1.



4. A farmer has two pieces of land shaped like the above diagrams. How many sq. m in *A*? In *B*? In *C*? In the whole piece? Express these areas in hektars.

5. What is the area of *D*? Of *E*? Of *F*? Of the second piece?

Continue the drill in finding the areas of irregular-shaped fields by drawing on the blackboard diagrams composed of rectangles and triangles, giving the dimensions.

Have the pupils measure and find the areas of several lots near the schoolhouse.

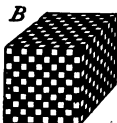
METRIC MEASURES OF VOLUME

69. Oral.

1. A is 10 mm long, 10 mm wide and 1 mm thick. How many cubic millimeters does it contain?

2. How many cubic millimeters does the cubic centimeter B contain?

To find the volume of a solid, multiply together the numbers expressing its length, breadth, and thickness. The dimensions must be expressed in the same unit of measure.



1000 CU. MM

Table of Volume

1000 cubic millimeters (cu. mm) = 1 cubic centimeter (cu. cm)

1000 cubic centimeters = 1 cubic decimeter (cu. dm)

1000 cubic decimeters = 1 cubic meter (cu. m)

Notice that in cubic measure the multiplier in the table is 1000.

Give the volumes of the solids whose dimensions are:

3. 4 cm, 10 cm, 6 cm.

6. 6 m, 8 m, 10 m.

4. 6 cm, 6 cm, 10 cm.

7. 4 m, $2\frac{1}{2}$ m, 8 m.

5. 10 cm, 10 cm, $6\frac{1}{2}$ cm.

8. 4.25 m, 10 m, 10 m.

9. How many cubic millimeters are there in 4 cubic centimeters? In 16 cu. cm? In $6\frac{1}{2}$ cu. cm? In 4.225 cu. cm?

10. How many cubic centimeters are there in 5 cubic decimeters? In $7\frac{1}{2}$ cu. dm? In 12.675 cu. dm? In 37.75 cu. dm?

11. Change $5\frac{1}{2}$ cu. m to cu. dm; 6.585 cu. dm to cu. cm.

12. Change 5.258 cu. cm to cu. mm; 8763 cu. mm to cu. cm.

13. Change 9075 cu. cm to cu. dm; 765 cu. dm to cu. m.

14. How many cubic meters are there in 4,500,000 cu. cm?

70. Written.

1. How many cubic centimeters are there in a solid 16 cm long, 8.5 cm wide, and 12.5 cm high? How many cubic decimeters?

2. A block 64 cm long, 37.5 cm wide, and 26.25 cm high contains how many cubic centimeters? How many cubic decimeters?

3. How many cubic meters of dirt were removed from a canal 475 m long, 2.4 m wide, and 1.5 m deep?

4. Find the cost of digging a ditch 300 m long, 1.24 m wide, and 1.8 m deep at ₱.65 a cubic meter.

5. Find the value of a block of marble 2.4 m long, 1.32 m wide, and 1.25 m thick at ₱37.50 per cubic meter.

6. Find the volume of a piece of timber 75 cm square and 4.4 meters long.

7. How many cubic meters are there in a pile of wood 6.4 m long, 1.5 m wide, and 2.5 m high?

8. What will it cost to fill in with sand a lot 35 m long and 16.4 m wide, to a depth of 40 cm, at ₱1.60 per cubic meter?

9. How many cubic meters of air are there in a schoolroom 12.5 m long, 6.4 m wide, and 4.62 m high?

10. A cistern 2.4 m long, 1.5 m wide, and 3.2 m deep is half full of water. How many cubic meters of water are there in the cistern?

11. If it costs ₱164 to dig a cellar 8.2 m long, 6.4 m wide, and 2.5 m deep, how much will it cost to dig a cellar 10.5 m long, 8.4 m wide, and 2.8 m deep, at the same rate?

12. Find the value of 5 sticks of timber each 5.4 m long and 40 cm square on the end, at ₱25 per cubic meter.

13. Find the value of the lime which fills a bin 3.6 m long, 2.5 m wide, and 1.4 m deep, at ₱10.50 per cubic meter.

METRIC MEASURES OF CAPACITY**71. Written.**

The principal unit of capacity for both liquid and dry measures is the liter. It contains 1 cubic decimeter.

Table of Capacity

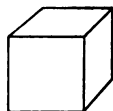
10 milliliters (ml)	= 1 centiliter (cl)
10 centiliters	= 1 deciliter (dl)
10 deciliters	= 1 liter (l)
10 liters	= 1 dekaliter (Dl)
10 dekaliters	= 1 hektoliter (Hl)
10 hektoliters	= 1 kiloliter (Kl)

A liter can or box and, if possible, a hektoliter box should be before the class. Pupils should be required to estimate the capacity of a number of vessels and test the correctness of their estimate by measuring.

1. How many liters are there in a cu. m? In 6.25 cu. m?
2. How many liters are there in 6.25 Hl? In 47.6 Hl? In 6.75 Hl? In 125.5 Hl? In 2546.37 Hl?
3. How many hektoliters are there in 475 liters? In 6420 l? In 82.5 l? In 8.4 l? In 4267 l? In 2003.54 l?
4. How many liters are contained in a tank 1.6 m long, 1.5 m wide, and 1.2 m deep? How many hektoliters?
5. How many hektoliters of water will it take to fill a tank 2.5 m long, 1.28 m wide, and 75 cm deep?
6. What is the value of the rice that fills a bin 80 cm by 80 cm by 80 cm at ₱.21 a ganta?
7. A box is 75 cm long and 40 cm wide. How deep must it be in order to hold 183 liters?
8. How many half-liter bottles can be filled from a can 35 cm square and 60 cm deep?

METRIC MEASURES OF WEIGHT**72. Written.**

The unit of weight is the **gram**. It is the weight of 1 cubic centimeter of water at 4 degrees centigrade.

Table of Weight

1 CU. CM



1 GRAM

10 milligrams (mg)	= 1 centigram (cg)
10 centigrams	= 1 decigram (dg)
10 decigrams	= 1 gram (g)
10 grams	= 1 dekagram (Dg)
10 dekagrams	= 1 hektogram (Hg)
10 hektograms	= 1 kilogram (Kg)
10 kilograms	= 1 myriagram (Mg)
10 myriagrams	= 1 quintal (Q)
10 quintals	= 1 metric ton (M T)

Since a liter contains 1000 cu. cm, a liter of water weighs a kilogram. Since a cubic meter contains 1000 liters, a cubic meter of water weighs a ton.

In studying weight, procure, or make, a pair of balances (see page 109, Part I) and have pupils estimate the weight of various objects in the schoolroom, and then test their estimates with the balances.

- Express in grams the weight of 1 liter of water; of 16.5 liters; of 125.25 liters; of 2.167 l; of .075 l.
- How many grams are there in .495 Kg? In 4.607 Kg? In 25.02 Kg? In 425.04 Kg?
- How many kilograms are there in 7562 grams? In 47,065 g? In 25 g? In 2.5 quintals? In .45 Q?
- Change 1675 Kg to Q; 407 Q to Kg; 95 mg to g.
- What will the water weigh that fills a tank 2.4 m long, 35 cm wide, and 24 cm deep?
- At ₱15.60 a metric ton, what will 750 Kg of coal cost?
- Change to Kg and add: 1765 g; .2054 M T; .4269 Q.

SPECIFIC GRAVITY**73. Written.**

1. A cubic centimeter of water weighs 1 gram. If a cubic centimeter of iron weighs 7.8 grams, iron is how many times as heavy as water?

The **specific gravity** (sp. gr.) of a substance is its weight as compared with the weight of an equal volume of water. The specific gravity of iron is 7.8.

2. What is the weight of 400 cubic centimeters of lead, if the sp. gr. of lead is 11.34?

3. If the specific gravity of mercury is 13.6, what will 250 cu. cm of mercury weigh? Analyze.

4. Find the weight of a piece of wood 20 cm square and 3 m long, if the specific gravity of the wood is .92.

5. Find the weight of the petroleum (sp. gr. .82) that fills a tin can 24 cm long, 24 cm wide, and 25 cm deep.

6. If $4\frac{1}{2}$ liters of milk weigh 4.59 Kg, what is the specific gravity of milk?

7. The oil that fills a can 20 cm by 20 cm by 30 cm weighs 9.9 Kg. What is the specific gravity of the oil?

8. How much does a piece of timber weigh that is 24 cm square and 5 m long, if the sp. gr. of the wood is .9?

9. If the specific gravity of a piece of zinc which weighs 1080 Kg is 7.2, what is its volume in cubic centimeters?

10. What is the specific gravity of silver, if 240 cu. cm of it weigh 2.52 Kg? Analyze.

11. Find the weight of 40 liters of alcohol having a specific gravity of .81.

12. A can of milk (sp. gr. 1.02) weighs 30.25 Kg. The empty can weighs 4.75 Kg. How many l of milk are there in the can?

METRIC REVIEW PROBLEMS**74. Written.**

1. The tunnel of a coal mine averaged 8 m by 4 m and was 255 m long. How much coal and earth had been removed? If



the weight of the material removed was 1100 Kg per cu. m, and $\frac{1}{3}$ of it was coal, how many tons of coal were obtained?

2. If the cars in which the coal was carried from the tunnel had an average capacity of 625 Kg; how many of these car loads would be needed to supply a vessel for a trip from Manila to Hongkong, if the vessel consumed 25 tons per day and required $2\frac{1}{2}$ days to make the trip?

3. Find the cost of filling in a building lot 54 m long and 22.5 m wide to an average depth of 32 cm, at ₱1.85 per cu. m.

4. Find the cost of a field 250 m square at ₱140 a Ha.

5. How many hektoliters of water will a rectangular cistern hold that is 1.3 m long, 90 cm wide, and 2.4 m deep?

6. What will be the weight of a load of 240 bricks, each 20 cm by 10 cm by 5 cm, if the sp. gr. of brick is 2.4?

7. What will it cost to paint the four walls of a room 5.5 m long, 4.5 m wide, and 4.2 m high, at ₱.28 a square meter?

8. How many bricks, each 20 cm by 10 cm by 5 cm, are there in a pile 2.2 m long, 1.4 m wide, and 1.2 m high?

9. A merchant bought 12.5 quintals of rice at ₱8.50 a quintal and sold it for ₱11 a kilo. How much did he gain?

10. If a liter of oil weighs .92 of a kilo, what must I pay for 120 liters at ₱.80 a kilo?

11. What must be the depth of a box 60 cm long and 75 cm wide, that it may hold 180 liters?

12. If a man walks 90 m per minute, how long will it take him to walk 44.55 kilometers at the same rate?

13. A man paid ₱24.75 for a pile of wood 4.4 m long, 1.25 m wide, and 2 m high. How much did he pay per cubic meter?

14. A tank full of water weighs 2.25 Q. The tank weighs $\frac{1}{8}$ as much as the water it contains. What is the capacity of the tank in liters?

15. A block of stone 1.2 m long, 50 cm wide, and 22 cm thick weighs 316.8 Kg. What is its specific gravity?

16. How many sq. m of zinc will it take to line the bottom and sides of a vat 3.9 m long, 1.2 wide, and .8 m deep?

17. What is the weight of the water in a tank if it takes 47 minutes to empty it at the rate of 125 l a minute?

18. If rain falls 3 cm deep on the level, how many liters is that per sq. m? How many tons per Ha?

19. Find the weight of a bar of iron (sp. gr. 7.8) 6 m long, 12 cm wide, and 5 cm thick.

20. A jar weighs 6.5 Kg when empty and 23.7 Kg when half full of water. What is its capacity?

21. If soil is cultivated to a depth of 18 cm, how many cu. m of cultivated soil is that per Ha?

22. A lot $37\frac{1}{2}$ m wide contains .6 Ha. How long is it? What will it cost to fence it at ₱.14 per meter?

23. A bin 2.25 m long, 1.2 m wide, and 2.5 m deep, is $\frac{3}{4}$ full of rice. How much rice does it contain?

24. Find the weight of a block of stone 1 m long, 45 cm wide, and 24 cm thick, if the stone is 2.5 times as heavy as water.

75. Written.

1. Find the cost of planting a plantation of 13.5 Ha with coffee and the cacao trees necessary for shade, if the cost per Ha is as follows: for plowing, 9 days' labor with carabao @ ₱1.85; for planting cacao seed, 4 days' labor @ ₱.65; cost of 7 gantas of cacao seed @ ₱.50; cost of 3333 coffee plants @ ₱1 per 100; for planting coffee, 10 days' labor @ ₱.60.



2. What will be the cost of caring for a coffee plantation of 14.7 Ha for three years, if the average annual cost per Ha is ₱35?

3. At ₱.95 per picul find the cost of cleaning and sorting the coffee from a plantation of 18.9 Ha if the crop averages 16.4 piculs per Ha. What will the crop sell for at ₱17.65 per picul?

4. During the years 1885–1890 the Philippine Islands exported coffee to the amount of 5,467,830 Kg, 7,156,388 Kg, 4,947,947 Kg, 6,289,255 Kg, 6,218,655 Kg, and 4,479,868 Kg. Find the total amount exported.

5. The coffee imported into the United States during the years 1901–1905 is shown in this table. What was the total amount imported? How much did the importation in 1905 exceed that in 1901?

1901	387,269,526 Kg
1902	494,879,528 Kg
1903	415,083,181 Kg
1904	451,351,633 Kg
1905	475,278,897 Kg

6. If coffee seeds are planted in a bed 6 m by $4\frac{1}{2}$ m, 15 cm apart in each direction, how many seeds are planted?

76. Written.

1. A farmer harvests 1350 piculs of sugar from 90 Ha of land. If the cost of planting and harvesting is $\frac{2}{3}$ of the value of the crop, for how much per picul must he sell the sugar to realize ₱18 per Ha from his land?

2. Half of A's land is equal to $\frac{3}{4}$ of B's and A has 18 Ha more than B. How many Ha has each?

3. A farmer realizes ₱1000 from his sugar crop. The cost of producing and marketing was ₱453.50. If he sold the sugar at ₱4.75 per picul, how many piculs did he harvest?

4. A farmer wishes to enclose a field 42.5 m by 36.3 m by 3 lines of iron wire. If 4 m of this wire weighs a kilo and it costs ₱.25 a kilo, how much will the wire cost?

5. A farmer has 85 Ha of land which he plants to sugar cane. He realizes ₱20 per Ha from his land by selling the sugar at ₱3.40 per picul. If the cost of producing the sugar was $\frac{2}{3}$ the value of the crop, how many piculs per Ha did the land produce?

6. A man invests $\frac{3}{4}$ of his money in a farm and builds a house costing $\frac{1}{2}$ of the remainder, and has ₱25.20 left. If the land cost ₱80 per Ha, how many Ha did he buy?

7. A farmer realizes ₱600 from his sugar crop, sold at ₱4 per picul. If the average yield per Ha was 5 piculs and labor cost $\frac{1}{2}$ the value of the crop, how many Ha of sugar did he harvest?

8. Mr. Santos has 80 Ha of land which yields an average of 8 piculs of sugar per Ha. With sugar worth ₱4 per picul, which is the better bargain, to give $\frac{2}{3}$ of the crop for planting and harvesting, or to pay 15 men ₱1.50 per day for 30 days? How much better is it?

MEASURES OF TIME

77. Oral.

Table of Time

60 seconds (sec.) = 1 minute (min.)

60 minutes = 1 hour (hr.)

24 hours = 1 day (da.)

7 days = 1 week (wk.)

12 months (mo.) = 1 year (yr.)

365 days = 1 year

366 days = 1 leap year

MONTHS	NO. OF DAYS	MONTHS	NO. OF DAYS
January (Jan.)	31	July	31
February (Feb.)	28 or 29	August (Aug.)	31
March (Mar.)	31	September (Sept.)	30
April (Apr.)	30	October (Oct.)	31
May	31	November (Nov.)	30
June	30	December (Dec.)	31

In most business transactions 30 days is considered a month, and 12 such months a year. 100 years is a century.

All years divisible by 4, except centennial years, are leap years. Centennial years divisible by 400 are leap years.

REDUCTION OF TIME MEASURES

78. Oral.

1. How many seconds are there in 3 minutes? In 5 min.? In 10 min.? In 10 min. 30 sec.? In 5 min. 25 sec.?
2. How many minutes are there in 5 hr.? In 8 hr.? In 5 hr. 15 min.? In 10 hr. 42 min.? In $4\frac{1}{2}$ hr.?
3. How many hours are there in $\frac{1}{2}$ da.? In 2 da.? In 10 da.? In 10 da. 8 hr.? In $\frac{3}{4}$ da.? In $2\frac{1}{2}$ da.?
4. How many minutes are there in 180 sec.? In 240 sec.? In 600 sec.? In 640 sec.? In 235 sec.?
5. How many seconds are there in 30 min.? In $1\frac{1}{2}$ hr.?
6. How many minutes are there in $\frac{1}{2}$ of a day? In $\frac{1}{3}$ of a day?

79. Written.

Reduce 3 da. 7 hr. 20 min. to minutes.

$$3 \times 24 \text{ hr.} = 72 \text{ hr.}$$

$$72 \text{ hr.} + 7 \text{ hr.} = 79 \text{ hr.}$$

$$79 \times 60 \text{ min.} = 4740 \text{ min.}$$

$$4740 \text{ min.} + 20 \text{ min.} = 4760 \text{ min.}$$

Since there are 24 hr. in 1 day, in 3 da. there are 3 times 24 hr., or 72 hr. $72 \text{ hr.} + 7 \text{ hr.} = 79 \text{ hr.}$ Since there are 60 min. in 1 hr., in 79 hr. there are 79 times 60 min., or 4740 min. $4740 \text{ min.} + 20 \text{ min.} = 4760 \text{ min.}$

Reduce:

1. 1 wk. 5 da. 11 hr. to min.

5. 3 wk. 3 da. to min.

2. 6 da. 6 hr. 48 sec. to sec.

6. $\frac{3}{8}$ da. to sec.

3. 4 da. 7 hr. 27 min. to sec.

7. .325 da. to min.

4. 5 wk. 3 hr. 48 min. to min.

8. 3 da. 12 min. to sec.

Change 47,901 minutes to weeks, days, hours, and minutes.

60)47901 min.

24)798 hr. + 21 min.

7)33 da. + 6 hr.

4 wk. + 5 da.

or 33 da., and 6 hr. remainder. Since 7 da. make 1 wk., 33 da. will make as many weeks as 7 is contained times in 33, or 4 wk., and 5 da. remainder. $47,901 \text{ min.} = 4 \text{ wk. } 5 \text{ da. } 6 \text{ hr. } 21 \text{ min.}$

Since 60 min. make 1 hr., 47,901 min. will make as many hours as 60 is contained times in 47,901, or 798 hr., and 21 min. remainder. Since 24 hr. make 1 day, 798 hr. will make as many days as 24 is contained times in 798,

9. Change 295,178 seconds to da. hr. min. and sec.
10. Change 1,730,751 seconds to wk. da. min. and sec.
11. Change 41,126 minutes to wk. hr. and min.
12. Change 4.375 days to seconds.
13. 450 seconds is what part of 2 hr. 30 min.? (Change to sec.)
14. 576 minutes is what decimal part of a day?
15. What part of a week is $3\frac{1}{2}$ hours?
16. If my watch gains 15 sec. a day, how many minutes will it gain in 2 weeks?

ADDITION OF TIME MEASURES**80. Written.**

Add: 4 yr. 8 mo. 21 da.; 6 yr. 6 mo. 18 da.; and 5 yr. 9 mo. 25 da.

yr.	mo.	da.	
4	8	21	<p>The sum of the days is 64; of the months, 23; of the years, 15. 64 days = 2 mo. 4 da. We place the 4 da. under the column of days and add the 2 mo. to the 23 mo., making 25 mo. 25 mo. = 2 yr. 1 mo. We place the 1 mo. under the column of months and add the 2 yr. to the 15 yr., making 17 yr. The sum is 17 yr. 1 mo. 4 da. In practice the final sum only is written.</p>
6	6	18	
5	9	25	
(15	23	64)	
17	1	4	

1. Add: 6 yr. 8 mo. 16 da.; 16 yr. 7 mo. 26 da.; 10 yr. 4 mo. 22 da.; 22 yr. 5 mo. 25 da.

2. Add: 24 da. 15 hr. 25 min. 40 sec.; 10 da. 12 hr. 33 min. 54 sec.; 15 da. 9 hr. 43 min. 36 sec.; 7 da. 52 min. 18 sec.

3. Add: 4 wk. 4 da. 20 hr. 35 min.; 6 wk. 18 hr. 40 min.; 10 wk. 5 da. 48 min.; 7 wk. 6 da. 22 hr.

4. What time is it 3 hr. 20 min. later than 11:34 a.m.?

5. A train, due at 27 min. past 8, was 1 hr. 42 min. late. When did it arrive?

SUBTRACTION OF TIME MEASURES**81. Written.**

What time is it 4 hr. 12 min. 20 sec. earlier than 20 min. 10 sec. past 2 p.m.?

hr.	min.	sec.	
2	20	10	<p>Since we cannot take 20 sec. from 10 sec., we take 1 min. from 20 min. leaving 19 min. in the minuend. 1 min. = 60 sec. 60 sec. + 10 sec. = 70 sec. 70 sec. - 20 sec. = 50 sec. 19 min. - 12 min. = 7 min. We cannot take 4 hr. from 2 hr. 2 p.m. is 2 hr. past noon but it is 14 hr. past the previous midnight. 14 hr. - 4 hr. = 10 hr. The time required is 10 hr. 7 min. 50 sec. past midnight, or 7 min 50 sec. past 10 a.m.</p>
4	12	20	
10	7	50	

1. From 40 yr. 4 mo. 20 da. take 12 yr. 8 mo. 25 da.
2. From 7 da. 5 hr. 45 min. 12 sec. take 3 da. 12 hr. 20 min.
3. From 125 yr. 6 mo. 7 da. take 41 yr. 11 mo. 29 da.
4. What time is it 8 hr. 35 min. 24 sec. earlier than 6:20 a.m.?
5. How many years, months, and days are there between Nov. 10, 1895, and May 27, 1908?

	yr.	mo.	da.
May 27, 1908, is written	1908	5	27
and Nov. 10, 1895, is written	1895	11	10

6. How long was it from Aug. 10, 1887, to Jan. 23, 1907?
7. How long was it from June 20, 1851, to Mar. 7, 1882?
8. How long was it from Oct. 24, 1825, to May 11, 1894?
9. Find the difference in time between July 24, 1807, and to-day.
10. Magellan discovered the Philippines March 16, 1521. How many years, months, and days have elapsed since then?
11. Washington was born Feb. 22, 1732, and died Dec. 14, 1799. How old was he when he died?

Find the exact number of days between Nov. 10, 1907, and Feb. 25, 1908.

Nov.	20	In November there are 20 days after the 10th. In
Dec.	31	December there are 31; in January, 31; and in Feb-
Jan.	31	ruary, 25. $20 + 31 + 31 + 25 = 107$; hence there are
Feb.	25	107 days between Nov. 10, 1907, and Feb. 25, 1908.
	<u>107</u>	

Find the exact number of days between :

12. Jan. 12, 1905, and June 12, 1905.
13. April 7, 1904, and Aug. 6 of the same year.
14. June 19, 1907, and Dec. 18, 1907.
15. Oct. 8, 1903, and March 25, 1904. (A leap year.)

MULTIPLICATION OF TIME MEASURES

82. Written.

Multiply 3 hr. 23 min. 21 sec. by 6.

hr.	min.	sec.	6 times 3 hr. 23 min. 21 sec. is 18 hr. 138 min. 126 sec. 126 sec. = 2 min. 6 sec. We write the 6 sec. in the seconds' column and add the 2 min. to the 138 min., making 140 min. 140 min. = 2 hr. 20 min. We write the 20 min. in the minutes' column and add the 2 hr. to the 18 hr., making 20 hr. The result is
3	23	21	
		6	
(18	138	126)	
20	20	6	

20 hr. 20 min. 6 sec. In practice the final product only is written.

Multiply:

1.	wk.	da.	hr.	9	2.	yr.	mo.	da.	10	3.	da.	hr.	min.	22
	3	6	11			12	5	15			12	8		
			9					10						20
4.	hr.	min.	sec.	15	5.	yr.	mo.	da.	65	6.	hr.	min.	sec.	27
	8	25	22			10	5	20			10	46		
			15					65						15
7.	hr.	min.	sec.	11	8.	wk.	da.	hr.	12	9.	da.	min.	sec.	30
	8	24	30			7	4	15			6	5		
			11					12						13½

10. At the rate of 1860 copies per hr., how many copies can a newspaper press print between 3:45 p.m. and 5:25 p.m.?

DIVISION OF TIME MEASURES

83. Written.

Divide 27 hr. 16 min. 12 sec. by 6.

hr.	min.	sec.	$\frac{1}{6}$ of 27 hr. = 4 hr., with 3 hr. remaining. 3 hr. = 180 min. 180 min. + 16 min. = 196 min. $\frac{1}{6}$ of 196 min. = 32 min. with 4 min. remaining. 4 min. = 240 sec. 240 sec. + 12 sec. = 252 sec. $\frac{1}{6}$ of 252 sec. = 42 sec. $\frac{1}{6}$ of 27 hr. 16 min. 12 sec. = 4 hr. 32 min. 42 sec.
6)27	16	12	
4	32	42	

Divide:

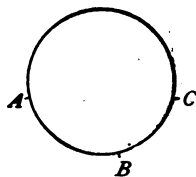
1. 82 hr. 35 min. 20 sec. by 10.
2. 155 yr. 5 mo. 29 da. by 11.
3. 64 hr. 41 min. 15 sec. by 15.
4. 229 hr. 43 min. 40 sec. by 15.
5. 45 wk. 6 da. 10 hr. by 7.
6. 152 hr. 20 min. 30 sec. by 15.
7. 125 wk. 5 da. 18 hr. by 12.
8. 134 yr. 8 mo. 20 da. by 20.

9. A carpenter worked $5\frac{1}{2}$ hr. on Monday, $7\frac{1}{2}$ hr. on Tuesday, 3 hr. on Wednesday, $8\frac{1}{2}$ hr. on Thursday, and $5\frac{1}{4}$ hr. on Friday. If $8\frac{1}{2}$ hr. are counted as 1 day's work, how much did he earn at P.95 a day?

LONGITUDE AND TIME

CIRCULAR MEASURE

84. Oral.



A circle is a plane figure bounded by a curved line, called the **circumference**, all points of which are equally distant from the center.

Any part of a circumference is an **arc**. *A* to *B* and *B* to *C* are arcs.

The circumference of every circle is divided into 360 equal parts called **degrees**, each degree into 60 equal parts called **minutes**, and each minute into 60 equal parts called **seconds**.

$\frac{1}{360}$ of a circumference is called 1 degree of arc.

$\frac{1}{4}$ of a circumference, or 90 degrees, is called a **quadrant**.

By drawing circles of different sizes, explain to your class that degrees are not fixed in length like meters, yards, etc.

Table of Circular Measure

60 seconds (") = 1 minute (')

60 minutes = 1 degree (°)

360 degrees = 1 circumference (Cir.)

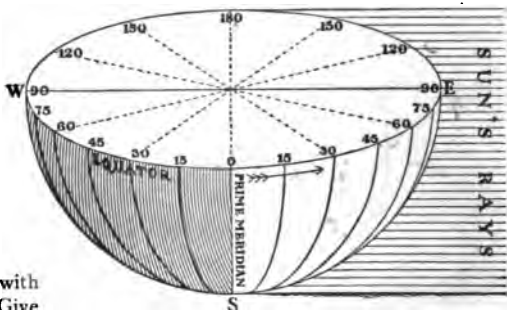
85. Oral.

A **meridian** is an imaginary line on the surface of the earth passing from the north to the south pole.

The **longitude** of a place is its distance in circular measure either east or west of a selected meridian called the **prime meridian**. The longitude of a place cannot exceed 180° .

The prime meridian commonly used passes through Greenwich, England. Places east of this meridian are said to be in **east longitude**; places west of it, in **west longitude**. All places on the same meridian have the same longitude.

This diagram represents a section of the earth. Along the prime meridian, just turning into sunlight, it is 6 a.m.; along the meridian 90° E., directly under the sun, it is noon; and along the meridian 90° W. it is midnight.



Teach longitude and time with a globe before the class. Give many oral problems similar to the ones given below.

86. Oral.

1. In what direction does the earth revolve on its axis?
2. How long a time is required for one revolution?

The place in which we live will turn through 360° between now and this time to-morrow; that is, in 24 hours. Therefore: 24 hours of time correspond to 360° of longitude.

1 hour of time corresponds to $\frac{1}{24}$ of 360° , or 15° of longitude.

1 minute of time corresponds to $\frac{1}{60}$ of 15° , or $15'$ of longitude.

1 second of time corresponds to $\frac{1}{3600}$ of $15'$, or $15''$ of longitude.

3. What is the difference in longitude between the prime meridian and a place 30° east? Between the prime meridian and a place 60° east? Between a place 30° E. and a place 60° E.?

4. What is the difference in longitude between the prime meridian and a place 45° west? Between the prime meridian and a place 90° west? Between a place 45° W. and a place 90° W.? Between a place 60° W. and a place 20° W.?

5. How do you find the difference in longitude between two places when both are east of the prime meridian? When both places are west of the prime meridian?

6. What is the difference in longitude between a place 30° E. and a place 30° W.? 20° W. and 10° E.?

7. How do you find the difference in longitude between two places when one is E. and the other is W. of the prime meridian?

8. If it is 6 o'clock a. m. on the prime meridian, what time is it 15° east of it? 45° E.? 60° E.? 90° E.? 105° E.? 15° W.? 30° W.? 45° W.? 60° W.? 90° W.? 180° W.?

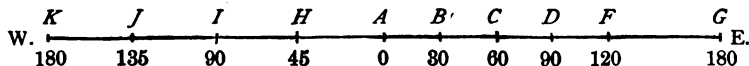
Notice that a place east of another has later time because it passes into the sunlight first.

9. When it is noon here, what time is it at a place 15° east of here? 15° west? 90° east? 90° west? Directly north?

10. When it is 9 a.m. at Manila, what time is it at a place 30° east of Manila? 60° west of Manila? 120° west of Manila?

11. Which has noon first on Jan. 6, San Francisco or Manila?

12. What is the difference in longitude between a place 15° west of Greenwich and a place 15° east? Which has the later time? How much later is it?



This diagram represents a complete circle of the earth. *A* is on the prime meridian.

13. Give the difference in longitude and then the difference in time between *A*, 0° , and *C*, 60° E.; between *B*, 30° E. and

D, 90 E.; between *F* and *G*; between *H* and *I*; between *I* and *K*; between *B* and *H*; between *H* and *C*; between *I* and *B*.

14. If it is noon at *A*, what time is it at *B*? At *C*? At *D*? At *F*? At *G*? At *H*? At *I*? At *J*?

15. When it is 6 p.m. at *H*, what time is it at *A*? At *B*? At *C*? At *D*? At *F*?

87. Written.

TABLE OF LONGITUDES

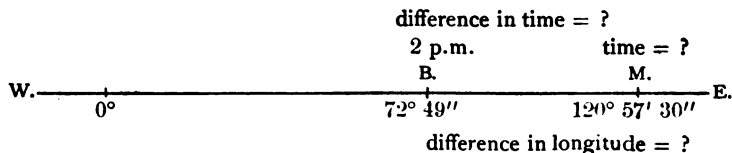
Paris	2° 20' 15" E.	Boston	71° 4' 0" W.
Berlin	13° 23' 45" E.	New York	74° 0' 0" W.
Bombay	72° 49' 0" E.	Washington	77° 3' 0" W.
Hongkong	114° 10' 30" E.	Chicago	87° 36' 45" W.
Manila	120° 57' 30" E.	Mexico	90° 5' 0" W.
Shanghai	121° 29' 0" E.	Denver	104° 57' 0" W.
Nagasaki	129° 52' 15" E.	San Francisco	122° 25' 45" W.
Tokyo	139° 44' 30" E.	Honolulu	157° 52' 45" W.

When it is 2 p.m. at Bombay, what time is it at Manila?

120° 57' 30" E.	longitude of Manila
72° 49' 0" E.	longitude of Bombay
<u>15)48° 8' 30"</u>	difference in longitude of M. and B.
3 12 34	$\frac{1}{15}$ of the difference in longitude

If 1° of longitude corresponded to 1 hr. of time, the difference between M and B. would be 48 hr. 8 min. 30 sec. Since 15° of longitude correspond to 1 hr. of time, the difference in time is $\frac{1}{15}$ of 48 hr. 8 min. 30 sec., or 3 hr. 12 min. 34 sec.

Since M. is east of B., it has the later time. 3 hr. 12 min. 34 sec. later than 2 p.m. is 12 min. 34 sec. past 5 p.m. — the time at Manila.



For each of the following problems draw a diagram similar to the one on p. 71, showing the longitude and the time of each place. Differences in solar time are to be found. Refer to the table on p. 71 for the longitudes of the cities named.

What is the difference in time between:

1. Greenwich and Manila? 4. Berlin and Tokyo?
2. Washington and Berlin? 5. Boston and Paris?
3. San Francisco and Chicago? 6. Manila and Tokyo?
7. When it is noon in Berlin, what time is it in Manila?
8. When it is 9:30 p.m. in Hongkong, what time is it in Paris?
9. When it is 4 p.m. in Berlin, what time is it in Boston?
10. When it is 1 p.m. in New York, what time is it in Denver?
11. When it is 2:30 p.m. in Chicago, what time is it in Honolulu?
12. What time is it in New York when it is 2:35 p.m. in San Francisco?
13. What time is it in Manila, when it is 11:20 a.m. in Bombay?

88. Written.

What is the longitude of Melbourne if its time is 1 hr. 36 min. 4 sec. later than the time of Manila?

Since 15° of longitude correspond to 1 hr. of time, the difference in longitude between two places is 15 times as great as the difference in time. The difference in longitude between Melbourne and Manila is $24^\circ 1'$.

Since Melbourne has the later time it is east of Manila.

120°	57'	30"	E.	longitude of Manila
24°	1'	0"		difference in longitude of Manila and Melbourne
144°	58'	30"	E.	longitude of Melbourne

1. The time of Rome is 49 min. 56 sec. later than that of Greenwich. What is the longitude of Rome?
2. The time of Moscow is 2 hr. 20 min. 56 sec. later than that of Paris. Find the longitude of Moscow.
3. When it is noon in Hongkong, it is 28 min. 39 sec. past 5 a.m. in Vienna. What is the longitude of Vienna?
4. What is the longitude of a place where it is 44 min. 52 sec. past 8 p.m. when it is 10 p.m. in Tokyo?
5. What is the longitude of a place where it is 14 min. 33 sec. past 8 p.m. when it is 1 p.m. in Boston?
6. When it is noon in New York, it is 55 min. 11 sec. past 10 a.m. in St. Louis. What is the longitude of St. Louis?
7. If a person travels from Tokyo to Manila, will his watch be too fast or too slow, and how much?
8. When it is 44 min. past 11 a.m. in Naples, $14^{\circ} 15' 30''$ E., what time is it in Moscow, $37^{\circ} 34' 15''$ E.?
9. When it is noon, Jan. 1, in San Francisco, what time is it in Manila?
10. When it is half past 3 p.m. in Denver, what time is it in Chicago?
11. The time in Manila is 5 hr. 33 min. 33 sec. faster than in Moscow. What is the longitude of Moscow?
12. When it is midnight in New York, what time is it in Washington?
13. The time in Boston is 11 min. 44 sec. faster than in New York. What is the longitude of Boston?
14. When it is 2 p.m. in Hongkong, it is 27 min. 8 sec. past 2 p.m. in Manila. What is the longitude of Manila?
15. The longitude of Vienna is $16^{\circ} 20' 15''$ E., and Vienna time is 11 min. 46 sec. faster than Berlin time. What is the longitude of Berlin?

PRACTICAL MEASUREMENTS

89. Oral.

Parallel lines are lines which are the same distance apart throughout their length.

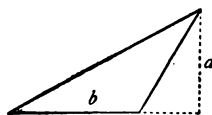


A **right angle** is the angle of a square, or 90° . Its sides are **perpendicular** to each other.

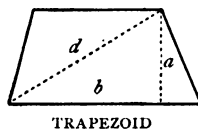


A **polygon** is a plane figure bounded by straight lines.

A **triangle** is a polygon of three sides.

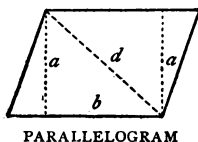


A **trapezoid** is a polygon of four sides, two of which are parallel.



A **parallelogram** is a polygon of four sides, opposite sides being parallel and equal.

A **rectangle** is a parallelogram whose angles are right angles.



The **base** is the side on which the figure is assumed to stand.

The **altitude** of a figure is the distance between the base and the highest point opposite.

The **diagonal** of a figure is a straight line joining opposite angles.

b = base
 a = altitude
 d = diagonal

The mere repetition of these definitions will not acquaint the pupils with the figures. The teacher should draw on the board many figures, varying the size and proportions, and test the ability of the pupils to recognize them by name. The pupils should be given practice in drawing them until the mention of a name calls forth an appropriate drawing.

The area of a parallelogram is equal to the product of its base and altitude. The base and altitude must be expressed in units of the same kind.

The diagonal of a parallelogram divides it into two equal triangles, whose bases and altitudes are equal respectively to the base and altitude of the parallelogram.

The area of a triangle is equal to one half the product of its base and altitude.

Give the areas of the following parallelograms :

- | | |
|----------------------------|---------------------------|
| 1. Base 20 cm, alt. 8 cm. | 4. Base 60 m, alt. 22 m. |
| 2. Base 30 cm, alt. 20 cm. | 5. Base 120 m, alt. 30 m. |
| 3. Base 44 m, alt. 20 m. | 6. Base 444 m, alt. 40 m. |

Give the areas of the following triangles :

- | | |
|-----------------------------|-------------------------------|
| 7. Base 60 m, alt. 25 m. | 10. Base 120 cm, alt. 120 cm. |
| 8. Base 125 cm, alt. 60 cm. | 11. Base 55 m, alt. 40 m. |
| 9. Base 20 m, alt. 84 m. | 12. Base 75 cm, alt. 200 cm. |

90. Written.

Find the areas of the following parallelograms :

- | | |
|---|---|
| 1. Base 64 cm, alt. 37 cm. | 6. Base 112.5 m, alt. 88 m. |
| 2. Base 96 cm, alt. $62\frac{1}{2}$ cm. | 7. Base 225 m, alt. 64.4 m. |
| 3. Base 4.7 m, alt. 95 cm. | 8. Base 237.5 m, alt. 80.8 m. |
| 4. Base 128 m, alt. $87\frac{1}{2}$ m. | 9. Base $240\frac{1}{2}$ m, alt. $125\frac{1}{2}$ m. |
| 5. Base 142.5 m, alt. 64 m. | 10. Base $288\frac{1}{2}$ m, alt. $137\frac{1}{2}$ m. |

11. I bought a piece of land in the form of a parallelogram. Its length was 244 m and its width 175 m. Find the cost at ₹ 125 a hektar.

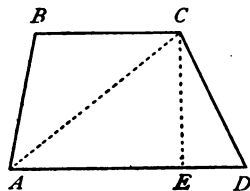
12. The area of a rectangle is 6600 sq. cm. Its altitude is 75 cm. What is its length?

13. At ₹ 150 a hektar, what will a farm in the shape of a parallelogram cost if its length is 480 m and its width 225 m?

14. I have a piece of land in the form of a parallelogram which contains 3.6 Ha. It is 225 m long. What is its width?

91. Written.

A trapezoid, such as $ABCD$, may be divided into two triangles by a diagonal, as AC . The altitude of each triangle is equal to the distance between the parallel sides of the trapezoid, represented by EC . The area of triangle $ACD = \frac{1}{2}$ of $AD \times EC$. The area of triangle $ABC = \frac{1}{2}$ of $BC \times EC$. The area of the trapezoid $= \frac{1}{2}$ of $(AD + BC) \times EC$.



The area of a trapezoid is equal to one half the sum of the parallel sides times the altitude.

Have the pupils draw figures for each of the following examples and problems, approximating the given proportions.

Find the areas of the following trapezoids :

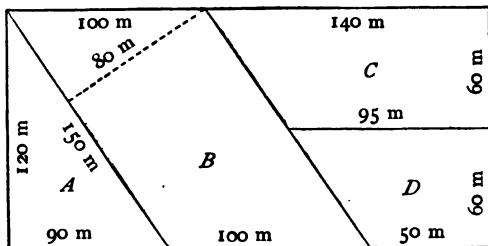
1. Parallel sides 50 cm and 70 cm, altitude 24 cm.
2. Parallel sides 48 m and 52 m, altitude 38 m.
3. Parallel sides 120 m and 160 m, altitude 75 m.
4. Parallel sides 125 m and 140 m, altitude 68 m.
5. Parallel sides 232 m and 188 m, altitude 155 m.
6. Find the area of a field in the form of a trapezoid whose altitude is 120 m and whose parallel sides are 130 m and 180 m.
7. At ₹ 145 a hektar, what is the value of a piece of land in the form of a trapezoid whose altitude is 75 m and whose parallel sides are 115 m and 125 m respectively?
8. One side of a field is 142 m long. The side parallel to it is 188 m long. The perpendicular distance between the sides is 82 m. Find the area.
9. What is the area of a board in the shape of a trapezoid, 5.4 m long, 30 cm wide at one end, and 40 cm wide at the other?
10. The area of a trapezoid is 497 sq. m. The altitude is 14 m, and one of the parallel sides is 28.5 m. Find the side to which it is parallel.

REVIEW PROBLEMS

92. Written.

A farm is divided into four fields — *A*, *B*, *C*, and *D*, as shown in the diagram.

1. Find the area of *A*; of *B*; of *C*; of *D*.



2. Find the area of the whole farm by adding the areas of the different fields. Test your answer by finding the area of the farm from its length and width.

3. Find the value of each field at ₱80 per hektar.
4. What will be the total cost of building a fence around this farm and between the fields at ₱.12 a meter?
5. What is the width of a rectangular field 250 m long that contains 4 hektars?
6. One side of a field is 262 m long. The side parallel to it is 218 m long. The perpendicular distance between the parallel sides is 95 m. What is the value of the field at ₱145 a hektar?
7. Find the cost of painting the four walls and ceiling of a room 6 m long, $5\frac{1}{2}$ m wide, and 4 m high at ₱.25 a sq. m, deducting 8 sq. m for windows and doors.
8. At ₱.15 a sq. m, find the cost of the cloth necessary to cover the walls and ceiling of a room 7 m long, 5 m wide, and $4\frac{1}{2}$ m high, deducting 6 sq. m for windows and doors.
9. Mr. Javato has a cacao plantation of 12 Ha, whose length is 3 times its width. What are its dimensions? The trees are set 4 m apart each way, each tree yields 1.25 Kg, and the cacao is worth ₱.96 a Kg. What is the value of the entire crop?

10. How many tiles, each 20 cm square, will it take to lay a floor 6.4 m long and 5.8 m wide? What will they cost at ₦7.00 a hundred?

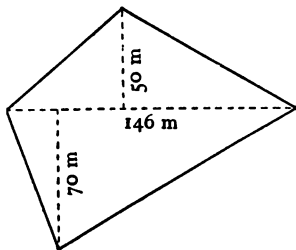
11. The area of a triangle is 880 sq. m. If the base is 40 m, what is the altitude?

12. Make a sketch of a box 25 cm long, 10 cm wide, and 10 cm deep. How many square centimeters of surface has it?

13. How many square meters are there in the walls and ceiling of a room 5 meters square and $4\frac{1}{2}$ meters high?

14. A walk 72.9 m long is to be built. How many tiles 27 cm square will it take to lay 1 row the full length of the walk? How many rows will there be if the walk is 1.35 m wide? How many tiles are necessary for the walk, and what will they cost at ₦60 a thousand?

15. I have a four-sided field shaped like the diagram (a trapezium). A diagonal 146 m long divides the field into two triangles. The altitude of one triangle is 70 m and of the other 50 m. Find the area of the field.



Draw the following figures to scale and find their areas:

16. A right-angled triangle, base $4\frac{1}{2}$ cm, altitude 3 cm.
17. A triangle having 2 equal sides (isosceles triangle), base 5 cm, altitude 6 cm.
18. A trapezoid, parallel sides 3 cm and 6 cm, distance between them $2\frac{1}{2}$ cm.
19. A parallelogram, base $5\frac{1}{2}$ cm, altitude $3\frac{1}{2}$ cm.
20. A rectangle, base $4\frac{1}{4}$ cm, altitude $3\frac{1}{4}$ cm.
21. A square whose sides are 4.2 cm.
22. A cube whose edges are $4\frac{1}{4}$ cm.



SAWALI

93. Written.

Sawali is generally woven in pieces 10, 15, or 20 meters long, and 1, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, etc., up to 5 meters wide, with an extra 5 cm for lapping.

In practice only the approximate cost of sawali work can be computed, as there is always a waste in cutting for doors and windows. Sawali should be purchased in widths to fit as nearly as possible the space it is to cover.

1. At ₦.02 $\frac{1}{2}$ a square meter, what will it cost to weave a piece of sawali 15 m long and $3\frac{1}{8}$ m wide?

2. At ₦.21 $\frac{1}{2}$ a square meter, what will the sawali cost for a partition 8 m long and 3 m high, if 4 sq. m are allowed for cutting out two doors?

3. At ₦.20 per sq. m, find the cost of the sawali necessary for the four walls and the ceiling of a house 9 m long, $4\frac{1}{2}$ m wide, and 3 m high, allowing $1\frac{1}{2}$ sq. m at each of 7 openings.

4. I wish to build a three-room house $13\frac{1}{2}$ m long, $4\frac{1}{2}$ m wide, and $3\frac{1}{2}$ m from floor to ceiling, with double outside walls, and with two single partitions running crosswise of the house. Making no allowance for openings, what will the sawali for the walls, ceiling, and partitions cost at ₦.20 per sq. m?

NIPA ROOFING**94. Written.**

The unit of measure for roofing is the **square meter**.

Nipas are made in lengths varying from 60 cm to 80 cm. They are usually laid in rows, with edges from 4 to 10 cm apart, and with ends lapping about 10 cm.

Thus, if nipas averaging 60 cm are laid in rows 10 cm apart, with a lap of 10 cm at the ends, 10 rows of 2 nipas each, or 20 nipas, will cover 1 sq. m. If the same nipas are laid in rows 5 cm apart, 20 rows of 2 nipas each, or 40 nipas, will cover 1 sq. m.

1. Allowing 50 nipas to the square meter, how many nipas will it take to cover a shed roof 11 m long and $4\frac{1}{2}$ m wide? What will the nipas cost at ₱4.40 a thousand?

2. At ₱3.30 a thousand find the cost of the nipa necessary for the four walls of a house $8\frac{1}{2}$ m long, $5\frac{1}{2}$ m wide, and $2\frac{1}{2}$ m high. (Deduct 10 sq. m for openings and allow 30 nipas to the square meter.)

3. A hip roof is composed of four triangles. The base of each triangle is 4 m and its altitude is $2\frac{1}{2}$ m. At ₱3.20 a thousand find the cost of the nipa for the entire roof, allowing 60 nipas to the square meter.

4. Find the cost of the nipa necessary to lay a shed roof 18.5 m long and 10.5 m wide, 40 nipas to the square meter, if the nipas cost ₱3 per thousand.

5. Each of the two sides of a hip roof is in the form of a trapezoid whose altitude is 5 m and whose parallel sides are 16 m and 8 m respectively. Each of the two ends is in the form of a triangle whose base is 8 m and whose altitude is 5 m. Allowing 60 nipas to the square meter, what will the nipa for the entire roof cost at ₱2.75 a thousand?

Give ten or more supplementary problems similar to those above, using the local price of nipa.

IRON ROOFING

95. Written.

Corrugated iron sheets are commonly 81 cm wide. They are usually laid with a lap of 2 corrugations (11 cm) along the sides and 20 cm at the ends.

The lengths of the pieces are: 1.83 m, 2.13 m, 2.44 m, 2.74 m, and 3.05 m.

The net areas covered by the pieces with laps as given above are: 1.15 sq. m, 1.35 sq. m, 1.57 sq. m, 1.78 sq. m, and 2 sq. m.

Where one length only is used, the approximate number of pieces necessary to cover a surface may be found by dividing the area of the surface by the net area of one piece. From one to four pieces extra are often allowed for waste in cutting. Such lengths should be chosen as will cover the width of the roof with as little waste as possible. A fraction of a sheet should be counted as one sheet.

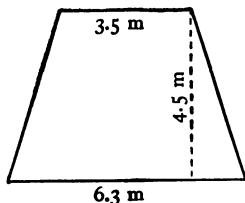
Net area means the area of a sheet less the area of the lap along the sides and at the ends.

1. Allowing 1.6 sq. m as the net area covered by each sheet, how many sheets of 2.44-m roofing will it take to cover a roof 7.4 m long and 4.7 m wide?

2. Allowing 1.3 sq. m net area to the sheet, how many 2.13-m sheets will it take to cover a roof 9.5 m long and 5.7 m wide?

3. If each sheet in No. 2 weighs 8.3 Kg, find the total cost of the roofing at ₦22 per quintal.

4. Estimating 8 Kg to the square meter, how many kilos of iron roofing are there in a roof 14 m wide and 14.5 m long?



5. If each piece in No. 4 weighs 12.5 Kg, how many pieces are there?

6. A roof, shaped like a trapezoid, is 6.3 m long at the eaves, 3.5 m long at the ridge, and 4.5 m wide. If each 2.44-m sheet covers 1.58 sq. m, net, how many sheets will cover the roof, allowing 3 sheets for waste?

LUMBER

96. Oral.

Lumber is usually sold either by cubic measure or by the foot, board measure, the unit of measure being usually defined as a piece of board 1 ft. square and 1 in.



thick. However, a bd. ft. consists of 144 cu. in., and any piece of timber not less than 1 in. thick and having a volume of 144 cu. in. is a foot of timber, board measure (1 ft., B. M. or 1 bd. ft.).

The number of bd. ft. in a piece of timber, not less than 1 in. thick, would be its volume in cu. in. divided by 144.

A board less than one inch must be considered as one inch thick in finding the number of ft., B. M.

A very easy way to find the number of ft., B. M., in a piece of timber is to multiply its length in feet by its width in feet by its thickness in inches. For if a board is 1 in. or less in thickness, the number of ft., B. M., it contains is the area of its surface in sq. ft.; therefore, if it is 2 in. thick it will contain 2 times as many ft., B. M.; 3 in. thick, 3 times as many, etc.

The symbols (') (") are commonly used for ft. and in. Thus, 2 ft. 5 in. is written 2' 5".

The unit of lumber measure in the metric system is the **board meter**, briefly called **meter**. 1 meter, board measure (B. M.), is a board 1 m long, 1 m wide, and 2 cm thick.

Boards less than 2 cm in thickness are considered as being 2 cm thick. Above 2 cm, the thickness is counted by half centimeters: as, 2½, 3, 3½, 4, etc.

A board 1 meter square and 3 cm thick is counted as 1½ board meters since it is 1½ times as thick as the unit thickness, 2 cm. A board 1 meter square and 3½ cm thick is counted as 1¾ meters, a cubic meter is counted as 50 meters, etc.

Heavy timbers are often measured by the cubic meter.

The number of meters equals the length (in meters) times the width (in meters) times ½ the thickness (in centimeters). When the thickness is 2 cm or less, the number of meters is the product of the length in meters and width in meters.

97. Written.

How many feet, B. M., are there in 20 boards, each 15 ft. long, 10 in. wide, and 2 in. thick?

$$\frac{\overset{5}{20} \times \overset{5}{15} \times 10 \times 2}{\underset{3}{12}} = 500 \text{ ft., B. M.}$$

How many feet, board measure, are there in:

1. 10 boards 24 ft. long, 1.5 ft. wide, and 1 in. thick?
2. 15 boards 18.4 ft. long, 14 in. wide, and 2 in. thick?
3. 20 boards 18.2 ft. long, 14 in. wide, and 1.5 in. thick?
4. 32 planks 1.5 ft. by 2 in. and 18 ft. long?
5. 24 joists 2 ft. by 2.5 in. and 20.2 ft. long?
6. 15 sticks of timber 1.5 ft. by .8 ft. and 12 ft. long?
7. 12 beams 8 in. by 12 in. and 18 ft. long?
8. 125 boards 9 in. by $\frac{3}{4}$ in. and 12 ft. long?
9. Find the cost of 38 boards, each 18 ft. long, 15 in. wide, and $1\frac{1}{2}$ in. thick, at ₱.08 per ft., B. M.
10. Find the total cost of 22 planks, 15 in. by 2 in. and 18 ft. long, at ₱75 per 1000 ft.; and 16 joists, 12 in. by 3 in. and 18 ft. long, at ₱90 per 1000 ft., B. M.
11. At ₱.18 per ft., B. M., find the cost of 2 beams each 15 in. square and 20 ft. long.
12. At ₱2 per cubic foot, what is the value of a piece of molave timber, 20 in. square and 18.2 ft. long?
13. Find the exact number of feet of lumber in a table having a top 9 ft. by 2.4 ft. by 1 in.; 2 pieces, each 7 ft. by 7 in. by 1.5 in.; 2 pieces, each $1\frac{1}{2}$ ft. by 7 in. by $1\frac{1}{2}$ in.; and 4 legs, each $5\frac{1}{2}$ in. square and 2.4 ft. long.

CONCRETE WORK**98. Written.**

Concrete reinforced with steel rods or wire netting makes a valuable building material in the Philippine Islands, because it withstands earthquake shocks.

About .25 cu. m (2.5 barrels) of cement, .50 cu. m of sand, and 1 cu. m of broken stone are often mixed to make about 1 cu. m of concrete.

1. Using the proportions given above, find the number of barrels of cement, the number of cubic meters of sand and of stone, used to mix 10.2 cu. m of concrete.

2. What is the total cost of the material used in No. 1 if the cement costs ₱6 per barrel, the sand ₱2 per cu. m, and the stone ₱4.50 per cu. m?

3. Find the number of cubic meters of sand and of broken stone, and the number of barrels of cement, needed to construct a concrete wall 4.5 m long, 3.25 m high, and .4 m thick. What will the wall cost at ₱25 per cu. m?

4. Counting 8 blocks to the sq. m, what will it cost at ₱.90 a block to build a partition wall 10 m long and 4.5 m high?

5. Allowing $2\frac{1}{2}$ barrels to the cubic meter, how many barrels of cement will it take to lay a concrete floor 17.5 m long, 12 m wide, the concrete being 12 cm thick?

6. Deducting 5.2 cu. m for openings, how many cu. m of concrete are there in the walls of a house 10 m long and 6.8 m wide, if the walls are 4 m high and .4 m thick?

7. At ₱.20 per kilo, find the cost of 850 meters of steel rods which weigh .8 Kg per meter.

8. How many blocks of concrete 20 cm by 30 cm by 60 cm will it take to lay a wall 7.2 m long, 4.8 m high, and 30 cm thick?

9. At ₱6 a barrel, allowing $2\frac{1}{2}$ barrels to the cu m, what will the cement cost for a concrete walk, 300 m long, 1.5 m wide, and 15 cm deep?

BRICK AND STONE WORK**99. Written.**

The unit of measure for brick and stone work is the **cubic meter**.



Stones of uniform size are usually laid by the hundred.

Common bricks are approximately 20 cm long, 10 cm wide, and 5 cm thick. From 700 to 800 common bricks laid in mortar are estimated to the cubic meter.

1. If 982 men can quarry 18,658 tons of rock in one month, how many tons can 1000 men quarry in the same time?
2. During one year 33,264 cu.m of rock, crushed on the island of Talim, were delivered in Manila. How many days of 8 hours each did it take to crush this amount, if 3 crushers were employed with a capacity of 21 cu. m each per hour? At ₱1.18 per cu. m, what was the cost of this crushed rock?
3. Estimating 750 bricks to the cubic meter, how many bricks are contained in a wall 16 m long, 2.5 m high, and .3 m thick?
4. Estimating 50 stones to the cubic meter, how many stones will it take to build a wall 250 m long, 2.2 m high, and 40 cm thick? What will the stones cost at ₱8.50 per hundred?
5. At ₱25 per thousand bricks, what will it cost to build a brick wall 42 m long, 2.1 m high, and 30 cm thick, if the bricks are laid 800 to the cubic meter?
6. How many bricks, 750 to the cubic meter, will be required for the four walls of a house 9 m long and 6.6 m wide, if

the walls are 2.4 m high and 30 cm thick, and 3.6 cu. m are allowed for openings?

7. How many cubic meters of stone wall will there be in a building 22 m long and 16 m wide, if the walls are 8 m high and .5 m thick, and 46 cu. m are allowed for openings?

8. How many stones, each 20 cm by 20 cm by 40 cm, will it take to lay a wall 24 m long, 1.6 m high, and .4 m thick? Find the total cost of the wall, if the stones cost ₱7 a hundred, and the laying ₱5 a hundred.

9. Find the cost of the tiles for a floor 15 m long and 7 m wide, if the tiles are 20 cm square and cost ₱80 a thousand.

10. Find the cost of building a walk 200 m long and 2 m wide with hard brick, which cost ₱25 a thousand, allowing 45 bricks to the sq. m and ₱.45 per square meter for labor.

11. At ₱1.85 per sq. m, how much will it cost to build a macadam road 500 m long and 12 m wide?

12. A brick house 10 m long and 7.8 m wide has walls 7 m high and .4 m thick. Find the cost of the walls, allowing 750 bricks to the cu. m and 26 cu. m for openings, if ₱22 a 1000 is paid for the bricks and ₱4.50 a 1000 is paid for laying them.

MISCELLANEOUS PROBLEMS

100. Written.

1. At ₱4.80 per cubic meter, what is the value of a pile of wood 7.5 m long, 1.2 m wide, and 2.5 m high?

2. At ₱.30 per square meter, what will it cost to paint the outside of a house 7 m long, 5.5 m wide, and 5.8 m high, deducting 14 sq. m for openings?

3. If 4 baseball bats are made from a piece of lauan 3 ft. long, 14 in. wide, and 3 in. thick, how many ft., B. M., will it take to make 80 bats?

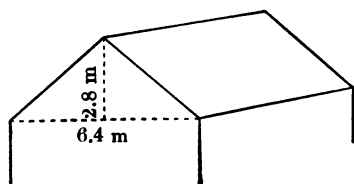
4. At ₱75 per thousand ft., B. M., find the cost of the lumber for a shed 18 ft. long and 10 ft. wide, as follows: 3 posts, 5 in. by 5 in., 10 ft. long; 3 posts, 5 in. by 5 in., 8 ft. long; 19 stringers, 4 in. by 1.5 in., 9 ft. long; 72 boards, 10 in. wide, 12 ft. long, and 1 in. thick.

5. At ₱.12 per sq. m, what will it cost to whitewash the two sides of a stone wall 42.5 m long and 2.2 m high?

6. Find the weight of a wooden beam 40 cm by 25 cm and 6.8 m long if the specific gravity of the wood is .92.

7. How many ft. of boards 2 in. thick are used in making a rectangular tank 6 ft. long, $3\frac{1}{8}$ ft. wide, and 38 in. high? (All outside measurements.)

8. How many hektoliters of water will the tank in No. 7 hold?



9. Find the area of the two gable ends of a house 6.4 m wide whose ridge is 2.8 m above the base of the gable.

10. What is the weight of 400 brick tiles, each 25 cm square and 3 cm thick, if the specific

gravity of the brick is 1.9?

11. At ₱3.20 per sq. m, what will it cost to build a concrete walk 34.5 m. long and 1.4 m wide?

12. Estimating 50 nipas to the sq. m, what will the nipas cost at ₱4.50 a thousand for a roof composed of 4 triangles, each having a base of 8 m and an altitude of 5 m?

13. Find the total cost of building a nipa house with material as follows: 6 posts at ₱6.50 each, 5 joists each 8 in. by 3 in. and 24 ft. long at ₱.09 ft., B. M., 170 bamboo poles at ₱35 a hundred, 6800 nipas at ₱4.20 a thousand, bejuco ₱10, labor ₱70.

14. What will it cost to paint the walls and ceiling of a room 5.5 m long, 4.4 m wide, and 3 m high, at ₱.35 per sq. m, allowing 8 sq. m for doors and windows?

15. A rectangular field containing 10.5 Ha is 280 m wide. What is its length?

16. Find the surface and volume of a cube whose edge is 10.5 cm.

17. What length of sawali $1\frac{1}{2}$ m wide must I buy for the four walls of a room $4\frac{1}{2}$ m long, 3 m wide, and 3 m high, if 6 sq. m are allowed for cutting out doors and windows?

18. If it takes 528 sheets of tin 60 cm long and 40 cm wide to cover a roof, what is the area of the roof?

19. What is the weight of the sand (sp. gr. 1.5) that fills a box 1.4 m long, .9 m wide, and .8 m deep?

20. How many ft., B. M., are there in a tapering board 12 ft. long, 12 in. wide at one end, 18 in. wide at the other end, and 1 in. thick?

21. Estimating 1300 Kg to the cu. m, how many tons of soft coal are contained in a bin 6.4 m long, 2.5 m wide, and 3.2 m deep?

22. At ₱65 per ton, what is the value of a stick of molave 45 cm square and 6 m long, if the sp. gr. of molave is 1.1?

23. Find the total cost of putting in a sawali partition $5\frac{1}{2}$ m long and $3\frac{1}{2}$ m high, using the following materials: 18 m of strips for uprights, at ₱.22 a meter; 22 m of strips for cross-pieces, at ₱.15 a meter; 22 m of strips for holding sawali, at ₱.05 a meter; sawali at ₱.25 a square meter; and labor, ₱3.50.

24. A cargo of grain from a vessel filled 43 bins, each $2\frac{1}{2}$ m square and 8 m deep. How many hektoliters of grain did the vessel carry?

REVIEW QUESTIONS

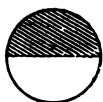
101. Oral.

Give a definition for each of the following:

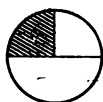
1. Factors of a number.
2. Highest common factor.
3. Multiple of a number.
4. Lowest common multiple.
5. Similar fractions.
6. Decimal fractions.
7. Reduction.
8. Specific gravity.
9. What is the primary unit of the metric system? How is its length determined? Where did this system originate?
10. What are the units of surface, volume, capacity, and weight in the metric system? Explain how each of these is derived from the primary unit.
11. Give the tables of the metric system.
12. Define *circle*; *circumference*; *arc*.
13. Define *meridian*; *prime meridian*; *longitude*.
14. Give the table for time measure; for circular measure.
15. Show how longitude is related to measures of time.
16. Define *polygon*. Name three kinds of polygons.
17. In what respect does a parallelogram differ from a trapezoid?
18. How do you find the area of a parallelogram? Of a triangle? Of a trapezoid?
19. Name five kinds of building material. What is the cheapest kind in the Philippine Islands?
20. What is meant by 1 meter, board measure?
21. Name three things that are measured by the cubic meter.
22. Name four things that are measured by the hektoliter.
23. What advantages has the metric system over the other Filipino and Spanish systems of weights and measures?

PERCENTAGE AND ITS APPLICATIONS

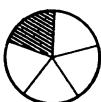
PERCENTAGE



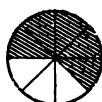
A



B



C



D



E

102. Oral.

1. What part of circle *A* is shaded? How many hundredths are shaded? How many hundredths are unshaded?

2. Repeat the questions in No. 1 for each of the other circles. Another name for hundredths is **per cent**.

The sign % means per cent. 6 per cent = $6\% = \frac{6}{100} = .06$.

3. Express decimally: 15 %; 25 %; 48 %; 92 %; $12\frac{1}{2}\%$; $6\frac{1}{4}\%$; $22\frac{1}{2}\%$; $8\frac{1}{2}\%$; $87\frac{1}{2}\%$; 125 %; 225 %; $112\frac{1}{2}\%$; 160 %.

4. What per cent of a circle is one half of it? One fifth? One tenth? Three fifths? Three tenths? Seven tenths?

5. Give the fraction that equals 50 %; 20 %; 25 %; 60 %; 70 %; 75 %; 80 %; 90 %; 5 %; 15 %; 45 %.

6. $.12\frac{1}{2}$, or $12\frac{1}{2}\%$ = what part? $.33\frac{1}{3}$, or $33\frac{1}{3}\%$ = what part?

7. What part of a number is $66\frac{2}{3}\%$ of it? $37\frac{1}{2}\%$ of it? $62\frac{1}{2}\%$ of it? $87\frac{1}{2}\%$ of it? $8\frac{1}{3}\%$ of it? $83\frac{1}{3}\%$ of it?

Percentage is the name given to that part of arithmetic that treats of per cents. It is one of the applications of decimals.

The **base** is the number of which the per cent is found.

The **rate** is a number of hundredths of the base to be taken.

The **percentage** is the result obtained by taking a certain per cent of the base.

The **amount** is the base plus the percentage.

The **difference** is the base minus the percentage.

Finding the Percentage**103. Oral.***Give quickly:*

1. 20 % of $\frac{1}{2}$ of 25; of 50; of 45; of 555; of 75.
2. 25 % of 40; of 60; of 48; of 64.8; of 28.8; of 96.4.
3. $33\frac{1}{3}$ % of 33; of 99; of 57; of 34.8; of ₱ 3.18.
4. $12\frac{1}{2}$ % of 80; of 64; of 72; of 8.8; of ₱ 8.72.
5. $16\frac{2}{3}$ % of 60; of 36; of 72; of ₱ 660; of ₱ 6.30.
6. 75 % of 40; of 80; of ₱ 12; of 20 m; of 44 Kg; of 72 Hl
7. $66\frac{2}{3}$ % of 30; of 21 l; of 66 g; of ₱ 666; of ₱ 3.24.

104. Written.

Find 9 % of ₱ 965.

₱ 965

Since 9 % is .09, we find 9 % or .09 of ₱ 965 by multiplying
as in decimal fractions.

$$\begin{array}{r} \text{₱ } 965 \\ \times .09 \\ \hline \text{₱ } 86.85 \end{array}$$
Find:

1. 15 % of 540.
2. 12 % of ₱ 396.
3. 18 % of ₱ 475.
4. $7\frac{1}{2}$ % of 680.
5. $22\frac{1}{2}$ % of 544.
6. 87 % of 608.
7. 35 % of ₱ 750.
8. 75 % of 424 boys.
9. $16\frac{1}{2}$ % of ₱ 880.
10. $8\frac{1}{5}$ % of 4000 oranges.
11. $87\frac{1}{2}$ % of ₱ 16.80.
12. $37\frac{1}{2}$ % of ₱ 36.80.
13. A grocer had 384 kilos of sugar and sold 75 % of it. How much had he left?
14. Mrs. de la Rama brought to Manila 60 meters of jusi and 36 meters of piña. If she sold 80 % of the jusi at ₱ .85 a meter and 75 % of the piña at ₱ 1.65 a meter, what did she receive for it?
15. 85 % of a class of 40 pupils are promoted. How many are not promoted?

16. A farmer raised 750 hektoliters of rice. 40 % of it was first class, 35 %, second class, and the rest, third class. How many hektoliters of each kind did he have?

17. I bought 11 horses at ₱128 each, and sold them at a gain of $12\frac{1}{2}$ % of the cost. What was the total gain? What was the average selling price of the horses?

18. A grocer paid ₱.20 a kilo for 425 kilos of sugar and sold it at a gain of 21 % of the cost. What did he receive for it?

19. A man having ₱380 spent 35 % of it for a horse, and 25 % of what remained for a cart. How much money had he left?

Finding the Rate

105. Oral.

1. 10 is what part of 40? What per cent of 40?
2. 20 is what per cent of 40? Of 80? Of 60? Of 200?
3. 5 is what per cent of 20? Of 25? Of 15? Of 30?

What per cent of:

4. 90 is 30? 36 is 6? 60 is 12? 32 is 4?
5. 30 m is 20 m? 40 l is 4 l? 5 Kg is 2 Kg? 8 Ha is 6 Ha?
6. ₱1.50 is ₱.50? ₱12 is ₱8? ₱160 is ₱20?
7. ₱1.25 is ₱.25? ₱50 is ₱30? ₱80 is ₱60? ₱25 is ₱2.50?
8. 25 liters is what per cent of a cavan? Of 2 cavaness?
9. A farmer had 64 Ha of land. If he sold 8 Ha, what per cent of his land had he left? Analyze.
10. A man who had ₱250 paid out ₱200. What per cent of his money had he left?
11. What % is gained on goods sold at double their cost?
12. A decimeter is what per cent of a meter?
13. A man having 80 goats, sold 20 of them. What per cent of his flock had he left?

106. Written.

What per cent of 25 m is 12 m?

12 m is $\frac{12}{25}$ of 25 m. $\frac{12}{25} = .48 = 48\%$

Write the percentage as the numerator and the base as the denominator of a fraction, and reduce this fraction to hundredths.

$$\begin{array}{r} .48 \\ 25 \overline{)12.00} \\ \underline{100} \\ 200 \\ \underline{200} \end{array}$$

What per cent of:

1. 225 is 75?
2. 248 is 62?
3. 360 m is 240 m?
4. 660 l is 264 l?
5. 420 g is 231 g?
6. 125 Kg is $37\frac{1}{2}$ Kg?
7. ₱840 is ₱315?
8. ₱175 is ₱42?
9. ₱65 is ₱16.25?
10. $\frac{4}{5}$ is $\frac{1}{2}$?
11. $\frac{8}{9}$ is $\frac{3}{5}$?
12. $\frac{1}{4}$ is $\frac{1}{5}$?
13. 32 is what per cent of 800? Of 1280?
14. ₱17.50 is what per cent of ₱350? Of ₱218.75?
15. 21 days in September were cloudy. What per cent of the days of the month were cloudy? Analyze.
16. What per cent of a cavan is 1 liter? $2\frac{1}{2}$ liters?
17. In a certain school there were 840 pupils enrolled, and the average daily attendance was 798. What was the per cent of attendance? 378 of the pupils enrolled were boys. What per cent of the school were boys?
18. A farmer raised 180 hektoliters of rice from 4.5 hektoliters of seed. What per cent of the crop was the seed?
19. A boy is in school $4\frac{1}{2}$ hours a day. He studies $1\frac{1}{2}$ hours and recites the remainder of the time. What % of the school time is spent in study? What % is spent in recitation?
20. Mr. Santos' salary is ₱1600. He spends $22\frac{1}{2}\%$ of it for rent, $12\frac{1}{2}\%$ for clothing, and ₱560 for food and incidentals. What per cent of his salary does he save?

Finding the Base

107. Oral.

8 is 20% of what number? 8 is 20% , or $\frac{1}{5}$, of 40.

1. 10 is $12\frac{1}{2}\%$, or $\frac{1}{8}$, of what number?

2. 22 is $33\frac{1}{3}\%$ of what number? 25% of what number?

Give the number of which:

3. 21 is 10%.

7. 220 is $33\frac{1}{3}\%$.

11. $\frac{2}{7}$ is $33\frac{1}{3}\%$.

4. 48 is 1%.

8. 8 is 5%.

12. .4 is 10%.

5. 200 is $12\frac{1}{2}\%$.

9. 111 is 20%.

13. .3 is $16\frac{2}{3}\%$.

6. 31 is $16\frac{2}{3}\%$.

10. $\frac{2}{3}$ is 25%.

14. .04 is 50%.

108. Written.

60 is 40% of what number? $40\% = \frac{2}{5}$

FIRST SOLUTION

$\frac{2}{5}$ of the number = 60.

$\frac{1}{5}$ of the number = $\frac{1}{2}$ of 60, or 30.

$\frac{5}{5}$ of the number = 5×30 , or 150.

Hence 60 is $\frac{2}{5}$ of 150.

SECOND SOLUTION

40% of the number = 60.

1% of the number = $\frac{1}{40}$ of 60, or 1.5.

100% of the number = 100×1.5 ,

or 150.

Hence 60 is 40% of 150.

Use the form of the first solution whenever it is possible.

Find the number of which:

1. 250 is 40%.

8. 363 is $37\frac{1}{2}\%$.

15. $12\frac{1}{2}$ is $12\frac{1}{2}\%$.

2. 117 is 15%.

9. 155 is 125%.

16. 168.48 is 8%.

3. 45 is $12\frac{1}{2}\%$.

10. 12 is $2\frac{1}{2}\%$.

17. 18.99 is $112\frac{1}{2}\%$.

4. 260 is $33\frac{1}{3}\%$.

11. 217 is $3\frac{1}{2}\%$.

18. 4 is $\frac{1}{5}\%$.

5. 12.5 is 5%.

12. 147 is 175%.

19. .8 is $133\frac{1}{3}\%$.

6. 749 is 70%.

13. 8 is $\frac{1}{2}\%$.

20. 14 is $2\frac{1}{3}\%$.

7. 484 is 110%.

14. 264 is 200%.

21. 2.2 is $\frac{1}{3}\%$.

22. A woman sold 24 meters of jusi which was $37\frac{1}{2}\%$ of all she had. At P.85 per meter what was the value of the jusi she had left?

23. Mr. Cailles sold 24 Ha of land, which was $37\frac{1}{2}\%$ of his farm. What was the farm worth at ₱87.50 per Ha?

24. A man spent 24% of his money for machinery which cost ₱33. How much money did he have left?

25. A merchant sold 150 sacks of rice and gained 20% of the cost. If his gain was ₱165, what was the cost per sack?

26. A man sold a carabao at a gain of \$19.55, which was 17% of the cost. Find the cost and the selling price.

27. In 1905 the Philippine Islands exported \$22,146,240 worth of hemp. If this was 68% of the total exports, what was the total value of the articles exported that year?

109. Oral.

1. If $1\frac{1}{2}$ times a number is 9, what is the number? If a number increased by $\frac{1}{2}$ of itself is 9, what is the number?

2. If 1.50 times a number is 9, what is the number?

3. What number increased by .50, or 50% of itself, equals 9?

4. If 100% of a number is 10, what is the number? If 120% of a number is 12, what is the number? If a number increased by 20% of itself is 12, what is the number?

5. What number increased by 25% of itself equals 15?

What number increased by:

6. 50% of itself = 30?

12. $16\frac{2}{3}\%$ of itself = 70?

7. 25% of itself = 50?

13. 40% of itself = 35?

8. $33\frac{1}{3}\%$ of itself = 40?

14. 25% of itself = 555?

9. 20% of itself = 30?

15. 20% of itself = 6.6?

10. 10% of itself = 44?

16. 50% of itself = 366?

11. $12\frac{1}{2}\%$ of itself = 18?

17. $12\frac{1}{2}\%$ of itself = 999?

18. A merchant sold a hat for ₱5, gaining 25% of the cost. What did the hat cost him?

110. Written.

What number increased by 20 % of itself equals 540?

A number increased by 20 % of itself is 120%, or $\frac{6}{5}$, of itself.

FIRST SOLUTION

$\frac{5}{6}$ of the number = 540.

$\frac{1}{6}$ of the number = 90.

$\frac{6}{6}$ of the number = 450.

SECOND SOLUTION

120 % of the number = 540.

1 % of the number = 4.5.

100 % of the number = 450.

What number increased by:

1. 20 % of itself = 732?

2. 10 % of itself = 484?

3. 40 % of itself = 756?

4. $37\frac{1}{2}$ % of itself = 693?

5. 24 % of itself = 434?

6. 45 % of itself = 812?

7. $7\frac{1}{2}$ % of itself = 1290?

8. 75 % of itself = 1015?

9. $16\frac{2}{3}$ % of itself = 735?

10. 55 % of itself = 527?

11. $12\frac{1}{2}$ % of itself = 603?

12. 42 % of itself = 923?

13. The number of pupils in a certain school is 322. The enrollment is 15 % larger than it was last year. How many were enrolled last year?

14. A man's salary has been increased 16 % and is ₱ 986 a year. What was his former salary?

15. A man sold a house for ₱ 2790, which was 24 % more than it cost him. What was the cost of the house?

16. A coal dealer sold 60 tons of coal for ₱ 756, thus gaining 20 % of the cost. What did the coal cost per ton?

17. A certain town has 5673 people, which is 22 % more than it had last year. What was the population last year?

18. There are 198 boys in a certain school, which is 32 % more than there are girls. What is the total number of pupils in the school? Analyze.

19. I owe A ₱ 143.75, which is 15 % more than I owe B. How much do I owe B?

111. Oral.

1. If $\frac{3}{4}$ of a number is 60, what is the number?
2. If 75 % of a number is 30, what is the number?
3. If a number decreased by 25 % of itself is 30, what is the number?
4. If a number decreased by $\frac{1}{3}$ of itself, or $33\frac{1}{3}$ % of itself, is 20, what is the number?
5. If a farmer sold 20 % of his rice and had 40 cavaness left, how many cavaness had he at first?
6. I sold a horse for ₱ 80, which was 20 % less than it cost me. How much did the horse cost?

What number decreased by:

- | | |
|--|--|
| 7. 25 % of itself = 90? | 13. 30 % of itself = 49? |
| 8. 20 % of itself = 16? | 14. 40 % of itself = 3.3? |
| 9. $33\frac{1}{3}$ % of itself = 24? | 15. 50 % of itself = $10\frac{1}{2}$? |
| 10. 10 % of itself = 18? | 16. 25 % of itself = 6.6? |
| 11. $12\frac{1}{2}$ % of itself = 70? | 17. 60 % of itself = 16? |
| 12. $16\frac{2}{3}$ % of itself = 100? | 18. 75 % of itself = 21? |
19. A table was sold for ₱ 25, which was $16\frac{2}{3}$ % less than it cost. What was the cost of the table?
20. Mangos were sold at ₱ .45 a dozen, which was a loss of 10 % of the cost. What was the cost per dozen?

112. Written.

What number decreased by 20 % of itself equals 416?

A number decreased by 20 % of itself is 80 % or $\frac{4}{5}$, of itself.

FIRST SOLUTION

- $\frac{4}{5}$ of the number = 416.
 $\frac{1}{5}$ of the number = 104.
 $\frac{4}{5}$ of the number = 520.

SECOND SOLUTION

- 80 % of the number = 416.
 1 % of the number = 5.2.
 100 % of the number = 520.

What number decreased by:

- | | |
|--|---|
| 1. 50 % of itself = 470 ? | 6. 16 % of itself = 315 ? |
| 2. 15 % of itself = 391 ? | 7. $16\frac{2}{3}$ % of itself = 2575 ? |
| 3. 22 % of itself = 585 ? | 8. $33\frac{1}{3}$ % of itself = 85 ? |
| 4. $12\frac{1}{2}$ % of itself = 735 ? | 9. 24 % of itself = 247 ? |
| 5. 28 % of itself = 306 ? | 10. $5\frac{1}{2}$ % of itself = 756 ? |

11. A farmer sold 25 % of his sheep and had 123 left. How many had he at first ?

12. A man spent 30 % of his salary and had ₱ 595 left. What was his salary ? Analyze.

13. The average attendance in a certain school is 624 pupils. This is 4 % less than the enrollment. What is the enrollment ?

14. If I weigh now 67.5 kilos and that is 10 % less than I weighed a year ago, what did I weigh a year ago ?

15. A boy withdrew 15 % of his money from the Postal Savings Bank and had ₱ 37.40 left. How much had he in the bank at first ?

16. Sugar is selling for ₱ 5.80 a quintal now, or 20 % less than the price a year ago. What was the price a year ago ?

17. The population of Iloilo Province, in 1903, was 408,575, and this was $37\frac{1}{2}$ % less than the population of Cebu Province. What was the population of Cebu ?

18. A city lot cost ₱ 2970, which was 10 % less than the cost of the house. What was the cost of both ? Analyze.

19. A merchant's sales in February were ₱ 3757.50. If this was $16\frac{2}{3}$ % less than the sales made during January, what was the amount of his sales during January ?

20. A dealer sold 75 quintals of hemp that had been damaged for ₱ 2046. If this was 12 % less than it cost him, what was cost per quintal ? Analyze.

GAIN AND LOSS

113. Oral.

1. If I paid ₱200 for a horse and sold it at a gain of 10%, what was the gain? The selling price?

2. If I paid ₱400 for goods and sold them at a loss of 10%, what was the loss?

3. If I buy goods at ₱500 and sell them at ₱600, what part of the cost do I gain? What per cent?

4. I paid ₱800 for a house and sold it for ₱700. What % of the cost did I lose?

5. A dealer sold a table for ₱50, thus gaining 25% of the cost. What did the table cost?

6. A man sold a piano for ₱600 and thus lost 25% of the cost. What was the cost?

7. By selling silk at a gain of ₱.60 a meter, 20% of the cost was gained. What was the cost?

8. A hat was sold for ₱.40 less than it cost. If the loss was 10% of the cost, what was the cost? The selling price?

9. A man paid ₱120 for a carabao and sold it at a loss of $16\frac{2}{3}\%$ of the cost. What was the selling price? The loss?

10. A grocer sold potatoes at ₱3.00 a crate, thus gaining 20% of the cost. What was the cost? The gain?

11. A man sold a watch at a loss of ₱2.10, which was 20% of the cost. Find the cost and the selling price.

12. Oranges bought for 2 centavos each are sold for 30 centavos a dozen. What % of the cost is gained?

The principles learned in Percentage apply to Gain and Loss. The *cost* corresponds to the *base*, the *gain* or *loss* is the *percentage*. The *selling price* is the *amount* when there is a gain, and the *difference* when there is a loss.

114. Written.

1. Find the profit on a bicycle bought at ₱112 and sold at a gain of 30 %.
2. What is the gain % when eggs that cost ₱.36 a dozen are sold for ₱.42 a dozen ?
3. Find the cost of goods sold for 22 % above cost at a gain of ₱363. Analyze.
4. A grocer bought 100 kilos of sugar for ₱20 and sold it at ₱.24 a kilo. What was his gain per cent ?
5. A merchant invested ₱1455 in rice which he sold at a gain of 18 %. What was the gain ? The selling price ?
6. A man bought 8 horses at ₱115 each and sold them at a gain of 25 %. What did he receive for them ? Analyze.
7. How many chickens costing ₱.50 each must be sold at a gain of 20 % to give a profit of ₱6.80 ? Analyze.
8. What % was gained on petroleum bought at ₱10 per hektoliter and sold at ₱.15 per liter ?
9. A man paid ₱7236 for a house and ₱464 for repairs. He then sold it for 21 % more than the entire cost. What did he receive for it ? Analyze.
10. Mr. De Vera bought 75 quintals of hemp at ₱28 a quintal. He sold $\frac{2}{3}$ of it at a gain of 15 % and the remainder at a loss of 20 %. Did he gain or lose and how much ?
11. What is the per cent of profit on maize bought at ₱2.50 a hektoliter and sold at ₱.03 a liter ? Analyze.
12. If I buy lemons at ₱5 a hundred, for how much a dozen must I sell them to gain 20 % ?
13. A merchant sold flour at a profit of 16 %, thus gaining ₱.44 on a sack. What was the cost per sack ?
14. A man sold a town lot for ₱674.70, which was 22 % less than it cost him. What did the lot cost him ? Analyze.

15. A farmer sold 12 pigs for ₱110.40, thus gaining 15%. What % would he have lost had he sold them for ₱84?

16. If I buy coconuts at ₱20 a thousand and sell them at a gain of 30%, how many must I sell to gain ₱25.50?

17. Mr. Clemente bought a house for ₱2520 and after expending ₱360 for repairs, sold it for the first cost. What % did he lose? Analyze.

18. A merchant marks soap bought at ₱2.40 per dozen bars so as to gain 20%. What is the marked price per bar?

19. A grocer's profits for a year were ₱5061.15 which was $6\frac{3}{4}\%$ of his sales. Find the amount of his sales. Analyze.

20. A horse cost ₱135 and a carabao $\frac{1}{2}$ as much. For what sum must both be sold to yield a profit of 25%?

21. Hats bought at ₱33.60 a dozen are sold for ₱3.85 apiece. What is the gain %? Analyze.

22. What was the cost of a watch if ₱5.60 was lost by selling it at 16% below cost? Analyze.

23. A merchant bought 22 quintals of rice at ₱9 a quintal and sold it at ₱.10 $\frac{1}{2}$ a kilo. What was his gain? His gain per cent?

COMMISSION

115. Oral.

1. If an agent receives ₱1 for selling ₱100 worth of goods, what per cent of the value of the goods does he receive for his services?

2. An agent bought some sugar for ₱1000 and charged 2% of the cost for his services. How much did he receive?

3. An agent sold a farm for ₱2000 and charged 2% of the selling price for his services. How much did he receive?

4. How much must I pay my agent for buying for me ₱3000 worth of hemp if his commission is 3%?

5. An agent received ₱180 for buying ₱6000 worth of goods. What was the rate of his commission?

An **agent** is a person who transacts business for another, such as buying or selling goods, collecting money, etc.

Brokers and commission merchants are agents.

The compensation of an agent is called **commission** or **brokerage**.

Commission is usually a certain per cent of the *cost* of goods bought, a certain per cent of the *amount received* for goods sold, or a certain per cent of the *amount collected*.

The **net proceeds** is the sum left after the commission and other expenses have been paid.

There are no new principles in commission. The sum of money collected or invested is the *base*, the rate per cent commission is the *rate*, the commission is the *percentage*. The net proceeds is the *difference*, and the remittance, including both commission and investment, is the *amount*.

116. Written.

1. An agent sold ₱2560 worth of copra. What was his commission at $2\frac{1}{2}\%$?

2. A commission merchant bought 450 piculs of sugar at ₱3.60 per picul. What was his commission at $2\frac{1}{2}\%$?

3. My agent is to buy for me 1575 kilos of beans at ₱.24 a kilo. His commission is $3\frac{1}{2}\%$. How much money must I send him to pay both the cost of the beans and his commission?

4. An agent received ₱59 for selling ₱1475 worth of rope. What was his rate of commission?

5. An agent was paid ₱23.80 for collecting a debt. How much did he collect if his commission was 5%?

6. A lawyer is paid 6% for collecting ₱380.50. How much must he pay over to his employer?

7. An auctioneer sold 12 beds at ₱12.50 each, 36 chairs at ₱1.25 each, and 10 tables at ₱8.50 each. What was his commission at $4\frac{3}{4}\%$? What were the net proceeds?

8. A commission merchant sold 1240 sacks of flour at ₱2.25 a sack. What was his commission at $4\frac{1}{4}\%$?

9. An agent received ₱12.24 for selling 320 kilos of coffee at ₱.85 a kilo. What was the rate of his commission?

10. A commission merchant sold 4200 kilos of tobacco at ₱.61 a kilo, and retained ₱163.50, which included his commission and ₱35.40 for freight. What was the rate of his commission?

11. An agent sold carabaos at ₱120 a head on 6% commission. His commission was ₱201.60. How many carabaos did he sell?

12. The net proceeds from a sale of hemp were ₱916.80. The rate of commission was $4\frac{1}{2}\%$. What did the hemp sell for?

13. A broker received ₱1066 with which to buy rice, after deducting his commission of 4%. Find his commission.

14. A farmer in Laguna province sent his mangos to Manila for one season, to be sold by an agent. After deducting his commission of 8%, the agent sent the owner ₱161.46. For how much did the mangos sell?

15. A commission merchant received ₱546 for selling 75 carabaos on a commission of $6\frac{1}{2}\%$. What was the average selling price of the carabaos?

16. I sent my agent in Japan ₱4845 to invest in coal at ₱9.50 a ton, after deducting his commission of 2%. How many tons did he buy?

17. An agent receives ₱5754 with which he is to buy land, after deducting a commission of 5%. How many hektars of land can he buy at ₱68.50 per hektar?

TRADE DISCOUNT**117. Oral.**

When a retail dealer pays cash for his goods, a deduction is usually made from the marked price.

When the wholesale price of merchandise falls, the wholesale dealer sometimes deducts a certain per cent from the marked price, instead of making a new price list. Sometimes several such discounts are allowed.

In either case the deduction is called a **trade discount**. The **list price** is the price given in the price list.

The **net price**, or **net amount**, is the list price less the discount.

1. What must I pay for a piano listed at ₱ 500, if I get 20 % discount ?

20 %, or $\frac{1}{5}$, of ₱ 500 = ₱ 100, the discount. ₱ 500 - ₱ 100 = ₱ 400, the price paid; or, deducting 20 % is the same as paying 80 % of the price. 80 % of ₱ 500 = ₱ 400.

2. What must I pay for goods marked at ₱ 1200, with a discount of $16\frac{2}{3}$ % ?

3. What do I pay for a pair of shoes listed at ₱ 4.50, with 10 % off for cash ?

4. What is the net price of a bill of goods listed at ₱ 2000, discount 12 % ?

118. Written.

What is the net amount of goods valued at ₱ 800, discounted 25 %, with a second discount of 10 % off for cash ?

₱ 800

200 1st discount

600 1st remainder

60 2d discount

₱ 540 2d remainder, or net
amount

25 % of ₱ 800, or ₱ 200, is the first discount. ₱ 800 - ₱ 200 = ₱ 600, the first remainder. This remainder is used as the base for the second discount. 10 % of ₱ 600 = ₱ 60. ₱ 600 - ₱ 60 = ₱ 540, net amount.

When there are two or more discounts, the first is computed on the list price, the second is computed on the first remainder as a base, the third on the second remainder as a base, etc.

Find the net amount of goods marked at :

1. ₱ 1200, with discounts 25 % and 15 %.
2. ₱ 850, with discounts 16 % and 10 %.
3. ₱ 1075, with discounts 20 % and $12\frac{1}{2}$ %.
4. ₱ 16.80, with discounts 25 % and $33\frac{1}{3}$ %.
5. ₱ 400, with discounts 10 %, 10 %, and 10 %.
6. ₱ 4600, with discounts 15 %, 10 %, and 5 %.
7. ₱ 750, with discounts 20 %, 5 %, and 5 %.
8. An importer buys goods at a discount of 25 % from the list price and sells them at a discount of 10 % from the list price. What is his gain per cent ?
9. Which is the better bargain and how much, to buy a 150-peso carromata at 40 % off, or 20 % and 20 % off ?
10. A dealer buys 227,500 coconuts at ₱ 24 a thousand. If he is allowed 5 % off for cash and sells them for ₱ 2.75 a hundred, how much does he gain ?
11. Find a single rate of discount equivalent to 20 %, 10 %, and 5 % off.
12. If a grocer buys sugar listed at ₱ .22 a kilo at a discount of 10 %, and sells it at ₱ $.23\frac{1}{10}$ a kilo, what is his gain per cent ?
13. One lumber merchant offers to sell me ₱ 2000 worth of lumber with discounts of 20 %, 10 %, and 5 % ; another merchant offers it with discounts of 15 %, 15 %, and 5 %. Which is the better bargain, and what is the difference in pesos ?
14. A bill of hardware is as follows : ₱ 40.40 at 25 % off ; ₱ 125 at 20 % and 10 % off ; ₱ 75.40 at 15 % off ; and ₱ 60.50 at 20 % and 5 % off. What is the net amount of the bill ?

TAXES**119. Oral.**

The expenses of government are paid by **taxes**, which are sums of money levied on persons, on property, or on business; by **duties**, or **customs**, which are charges on goods imported or exported; and by **internal revenue**, which consists of charges on certain goods manufactured or produced.

Real estate, or **real property**, is immovable property, such as houses and lands.

Personal property is movable property, such as money, horses, cattle, household goods, farm products, etc.

The value of real property in the Philippines is declared by the owner and revised by **boards of assessors**.

Most male residents of the Philippines between eighteen and sixty years of age pay a **cedula tax** of ₱1. This is increased to ₱2 if not paid before a certain date.

A land tax that is not paid when due has a 15% penalty added.

Applying the principles of percentage, the assessed value of the property is the *base*, the per cent of taxation is the *rate*, and the tax is the *percentage*.

The fiscal year for taxation in the Philippines begins July 1st of one year and ends June 30th of the next year.

1. My real property is assessed at ₱4000. What is the tax at 1%? At $1\frac{1}{2}\%$? At $\frac{3}{4}\%$?

2. If the tax on ₱600 worth of property is ₱3, what is the tax rate?

3. If a 2% tax on a certain property gives ₱32, what is the assessed value of the property?

4. Give the tax when the property value is ₱12,000, rate $\frac{1}{2}\%$; property ₱4800, rate $\frac{1}{4}\%$; property ₱2200, rate $1\frac{1}{2}\%$.

120. Written.

1. Mr. Villar has a house and lot in Manila assessed at ₱3240. What will be his yearly tax at $2\frac{1}{2}\%$?

2. Mr. Javier has a lot valued at ₱4296 and other property valued at ₱1361. What is his whole tax at $1\frac{1}{2}\%$?

3. A man has property valued at ₱4960. If the tax of $\frac{5}{8}\%$ is not paid when due, and a penalty of 15% of the tax is added, how much must he pay?

4. At ₱.04 a liter, what will be the tax on 1906.5 hektoliters of beer made by a certain brewery during one month?

5. At ₱.48 per kilo the tax on manufactured tobacco amounted in one year to ₱120,696. How many kilos were manufactured?

6. What is the total forestry tax on 428.5 cu. m of first class timber at ₱2.50 per cubic meter, and 988.6 cu. m of second class at ₱1.50 per cubic meter?

7. Persons paying cedula tax constitute 16% of the population of a certain town. If the total cedula tax at ₱1 each amounts to ₱680, what is the population of the town?

8. The tax on matches manufactured in Manila during the year ending June 30, 1906, was ₱124,195.60. If the tax on each gross of boxes was ₱.40, how many gross of boxes were manufactured?

9. A certain factory made for home consumption during one year, 3,437,500 cigars. 40% of these were taxed at ₱2 a thousand, 36% at ₱4 a thousand, and the rest at ₱6 a thousand. Find the total tax paid by the factory.

10. If a merchant pays a business tax of ₱162.52, which is $\frac{1}{3}\%$ of the total amount of sales made by him during the year, what is the amount of his sales?

11. A man has real estate assessed at ₱4320. If a penalty of 15% is added to the tax of $\frac{7}{8}\%$, what is the total tax?

DUTIES OR CUSTOMS

121. Oral.

Taxes collected by the government upon imported or exported goods are called **duties**.

A duty that is a certain per cent of the cost of the goods is called an **ad valorem duty**.

A duty levied on goods by number, weight, or measure without regard to value is called a **specific duty**.

Gross weight (G.W.) is the weight of goods including boxes, packing materials, etc.

Net weight (N.W.) is the weight of the goods after the weight of boxes or other packing materials has been deducted.

A **surtax** is a certain per cent of the original duty, which is added to the original duty to give the entire duty.

1. At 20 % ad valorem, what is the duty on books worth ₱550?
2. At ₱6 per hundred kilos, what is the duty on 200 kilos of writing paper?
3. What is the duty on 2200 kilos of butter at ₱.10 a kilo?
4. The duty on a lot of writing paper at 20 % ad valorem was ₱108. What was the value of the paper?

122. Written.

1. D. Ortigas & Co. imported 12 plows at ₱25 each and a rice huller worth ₱650. At 5 % ad valorem, what duty was paid?

2. A jeweler in Manila bought in Germany 16 watches at ₱27.50 each and 21 clocks at ₱45.20 each. If he paid an ad valorem duty of 20 % on the watches and 25 % on the clocks, what was the entire cost to the merchant?

3. A grocer in Iloilo imported 250 cans of fruit weighing $1\frac{1}{4}$ kilos each, duty ₱.04 per kilo; and 16 dozen cans of condensed milk weighing $\frac{1}{2}$ kilo each, duty ₱.05 per kilo. Find the duty.

4. A dry goods merchant imported 460 kilos of cloth, on which he paid a specific duty of ₱.35 per kilo and a surtax of 30 %. What was the total duty?

5. Find the total duty on: 48 bicycles costing ₱65.50 each, duty 20 %; 28 typewriters costing ₱72.50 each, duty 15 %; and 18 phonographs costing ₱32.25 each, duty 30 %.

6. At 20 % ad valorem, a merchant paid ₱292.80 duty on 96 dozen baseballs. What did the balls cost per dozen?

7. A railroad company imported at one time 1255 metric tons of iron rails. What was the duty at ₱.60 per hundred kilos?

8. An importer pays ₱49.50 per metric ton for oats. If the duty is ₱.20 per hundred kilos, for how much must he sell the oats per hundred kilos to gain 20 % on the whole cost?

9. Find the total export duty on the following: 8850 kilos of sugar, duty ₱.10 per hundred kilos; 12,680 kilos of copra, duty ₱.20 per hundred kilos; 6480 kilos of raw tobacco, duty ₱3 per hundred kilos; and 25,850 kilos of hemp, duty ₱1.50 per hundred kilos.

10. What is the total duty on the following bill of shoes: 48 pairs of men's shoes, duty ₱.60 a pair; 64 pairs boys' shoes, duty ₱.40 a pair; 72 pairs women's shoes, duty ₱.50 a pair; and 56 pairs girls' shoes, duty ₱.60 a pair?

11. A stationer bought 25,000 envelopes, weighing 4 kilos per 1000, for ₱.75 per 100. If the duty was ₱6 per hundred kilos, with a surtax of 30 %, what was the total cost of the envelopes?

12. A merchant imported 15 dozen suits of woolen underwear costing ₱2.40 a suit, duty 35 % ad valorem; 36 dozen pairs of socks costing ₱5.20 a dozen, duty 40 %; and 45 woolen blankets at ₱4.20 each, duty 35 %. Find the total duty.

13. Find the duty on 500 barrels of cement, averaging 136 Kg each at ₱.08 per quintal (G.W.).

INSURANCE

123. Oral.

I have a house which cost me ₦3000. If a company gives a written promise to pay me ₦2000 if the house burns, and charges me 1% of this sum for the promise, or insurance, what do I pay for the insurance?

Insurance is an agreement to compensate any one for some specified loss or damage.

An agreement to compensate for loss by fire is called **fire insurance**; for loss of property at sea, **marine insurance**; for loss by personal injuries, **accident insurance**; for loss by death, **life insurance**. There are many other forms of insurance.

The **policy** is the written contract between the insurance company and the person insured.

The **face of the policy** is the amount specified to be paid in case of loss.

The **premium** is the sum paid for insurance. It is a certain per cent of the face of the policy and is usually paid annually in advance. Houses are usually insured for three or five years.

Property is rarely insured for more than $\frac{3}{4}$ or $\frac{1}{2}$ of its value.

The amount insured (face of the policy) is the *base*; the premium is the *percentage*.

Property Insurance

124. Oral.

1. What will it cost to insure a house for ₦4400 at $1\frac{1}{2}\%$?
2. Find the premium if a house worth ₦6000 is insured for $\frac{3}{4}$ of its value at $1\frac{1}{2}\%$. At $2\frac{1}{5}\%$.
3. The premium on an insurance of ₦2400 was ₦12. What was the rate?
4. I paid a premium of ₦30 to insure goods at $1\frac{1}{2}\%$. For what amount were they insured?

125. Written.

1. What does an insurance of ₱16,000 cost at $1\frac{1}{4}\%$?
2. A house worth ₱3000 is insured for $\frac{3}{4}$ of its value at $1\frac{1}{5}\%$. What is the premium?
3. The premium for insuring a house at $1\frac{1}{4}\%$ was ₱85.50. For what amount was the house insured?
4. If it costs ₱39.60 to insure a stock of goods for ₱5280, what is the rate of premium?
5. Mr. Dizon insured his store for $\frac{3}{4}$ of its value at $\frac{4}{5}\%$, paying a premium of ₱45. Find the value of the store.
6. What is the amount of my policy when it costs me ₱28.80 to insure my library at $1\frac{1}{5}\%$?
7. A cargo of hemp worth ₱5400 is insured for $\frac{5}{8}$ of its value at $3\frac{1}{4}\%$. If the cargo is lost, what is the actual loss to the owner?
8. A shipper paid ₱148.50 insurance on a cargo worth ₱8250 insured for $\frac{4}{5}$ of its value. What was the rate of premium?
9. A factory worth ₱146,000 is insured for $\frac{5}{8}$ of its value. What will the premium amount to in 3 years at $1\frac{1}{5}\%$ annually?
10. A house was insured for $\frac{1}{2}$ of its value at $1\frac{1}{2}\%$, and a mill for $\frac{3}{4}$ of its value at $\frac{3}{4}\%$. If the premium on each was ₱45, what was the value of each?

Life Insurance**126. Written.**

Life insurance is indemnity against loss of life.

An **ordinary life policy** is a policy which secures the payment of a certain sum of money at the death of the person insured.

A **limited-payment life policy** is paid for in a limited number of years, usually 10, 15, or 20 years, after which it is said to be **paid up**; that is, the indemnity continues but the payment of premiums ceases.

An **endowment policy** is a policy which secures the payment of a certain sum of money at a specified time, or at death, if the person dies before the specified time.

In the following table of Annual Premium Rates, the rate of premium is given in pesos and centavos per ₱1000, and depends upon the kind of policy and the age of the person insured.

AGE	ORDINARY LIFE	10-PAYMENT LIFE	15-PAYMENT LIFE	20-PAYMENT LIFE	10-YEAR ENDOWMENT	15-YEAR ENDOWMENT	20-YEAR ENDOWMENT
20	₱19.10	₱44.00	₱33.10	₱27.83	₱106.51	₱68.27	₱49.62
25	21.34	47.77	35.99	30.25	106.96	68.77	50.18
30	24.18	52.28	39.44	33.20	107.57	69.45	50.96
35	27.88	57.72	43.65	36.87	108.41	70.43	52.13
40	32.76	64.30	48.83	41.46	109.66	71.93	53.98
45	39.36	72.32	55.33	47.42	111.63	74.40	57.03
50	48.39	82.24	63.72	55.38	114.97	78.55	62.15
55	60.82	94.57	74.71	66.30	120.45	85.37	70.51

Use the above table in solving the following problems.

Find the annual premium on the following:

1. An ordinary life policy for ₱4000 (age 35).
2. A 20-payment life policy for ₱8000 (age 30).
3. A 15-year endowment policy for ₱10,000 (age 35).
4. If a man 25 years old insures his life for ₱8000, 15-payment life policy, and dies at the age of 32, how much more does his family receive than was paid in premiums?
5. A man 20 years old took out a 20-year endowment policy for ₱6000. His dividends averaged ₱18.40 a year. If he died at the age of 35 years, how much was received more than was paid in?

INTEREST**127. Oral.**

1. A man borrows ₱400 for 1 year and agrees to pay 10% of this sum for its use. How much does he pay for the use of the ₱400?

2. How much must I pay for the use of ₱600 for 1 year at 6%? At 8%? At 10%? At 12%?

3. At 6% per annum, what must I pay for the use of ₱1000 for 1 year? For 2 years? For 7 years?

4. A farmer borrows ₱200 at 10% for 4 years. What total amount should he repay at the end of that time?

Interest is money paid for the use of money. It is a certain per cent of the principal.

The **principal** is the money loaned at interest.

The sum of the principal and the interest is the **amount**.

Rate of interest is the annual rate per cent.

In computing common interest, 30 days are usually regarded as a month, and 12 such months (360 days) as a year.

Give the interest on:

- | | |
|---------------------------------------|--|
| 5. ₱300 at 8% for 3 yr. | 11. ₱500 at 8% for 3 mo. |
| 6. ₱400 at 8% for 4 yr. | 12. ₱1000 at 6% for $1\frac{1}{2}$ yr. |
| 7. ₱400 at 5% for $2\frac{1}{2}$ yr. | 13. ₱2000 at 12% for 6 mo. |
| 8. ₱1200 at 10% for $\frac{1}{2}$ yr. | 14. ₱310 at 10% for 4 yr. |
| 9. ₱800 at 10% for 6 mo. | 15. ₱400 at 8% for 3 yr. |
| 10. ₱300 at 8% for $1\frac{1}{2}$ yr. | 16. ₱240 at 10% for 1 yr. 3 mo. |

Give the amount of:

17. ₱100 at 8% for 2 yr.; for 4 yr.; for 6 yr.
18. ₱500 at 6% for 3 yr.; for 4 yr.; for 5 yr.
19. ₱400 at 10% for 2 yr.; for $2\frac{1}{2}$ yr.; for 4 yr.
20. ₱120 at 10% for $\frac{1}{2}$ yr.; for $2\frac{1}{2}$ yr.; for 9 mo.

128. Written.

Find the interest on ₱ 540 for 2 yr. 5 mo. 10 da. at 8%.

₱ 540 principal

.08 rate

12)43.20 interest for 1 yr.

3)3.60 interest for 1 mo.

₱ 1.20 interest for 10 da.

₱ 86.40 interest for 2 yr.

₱ 18.00 interest for 5 mo.

₱ 105.60 interest for 2 yr.
5 mo. 10 da.

When the time is expressed in years, months, and days, change the months to a fraction of a year, counting 12 mo. as 1 year, and change the days to a fraction of a month, counting 30 days as 1 month.

2 mo. = $\frac{1}{6}$ yr.

10 da. = $\frac{1}{3}$ mo.

6 mo. = $\frac{1}{2}$ yr.

12 da. = $\frac{2}{3}$ mo.

7 mo. = $\frac{7}{12}$ yr.

25 da. = $\frac{5}{6}$ mo.

Find the interest for 1 year and multiply it by the number representing the years or parts of a year.

Find the interest on :

1. ₱ 840 for 2 mo. 20 da. at 6%.
2. ₱ 620 for 3 yr. 8 mo. at 9%.
3. ₱ 1260 for 2 yr. 10 mo. 10 da. at 7%.
4. ₱ 252 for 60 da. at $4\frac{1}{2}$ %.
5. ₱ 2460 for 3 yr. 7 mo. 24 da. at 6%.
6. ₱ 545.20 for 1 yr. 9 mo. at 5%.
7. ₱ 816 for 4 yr. 5 mo. at $7\frac{1}{2}$ %.
8. ₱ 5280 for 4 mo. 18 da. at 10%.
9. ₱ 240 for 3 yr. 24 da. at 8%.
10. ₱ 675.60 for 2 yr. 6 mo. 5 da. at 7%.

In final results a fraction of a centavo may be dropped if it is less than one half and may be called another centavo if it is one half or more than one half.

Find the amount of :

11. ₱ 365.50 for 3 yr. 6 mo. 21 da. at 8%.
12. ₱ 990 for 5 yr. 3 mo. 9 da. at 10%.

13. ₦1240 for 60 da. at $8\frac{1}{2}\%$.
14. ₦4280 for 93 da. at 12% .
15. ₦82.50 for 11 mo. 21 da. at 6% .
16. ₦415.20 for 5 yr. 10 mo. 10 da. at 5% .
17. ₦3600 for 11 mo. 11 da. at 9% .
18. ₦18.60 for 1 yr. 8 mo. 15 da. at $7\frac{1}{2}\%$.
19. ₦45.30 for 2 yr. 4 mo. 12 da. at 4% .
20. ₦336 for 3 yr. 22 da. at $3\frac{1}{2}\%$.
21. ₦827.50 from Jan. 15, 1909, to Nov. 12, 1909, at 8% .
22. ₦515.20 from June 12, 1907, to March 22, 1908, at $5\frac{1}{2}\%$.
23. ₦735.40 from Aug. 24, 1906, to May 3, 1908, at 12% .
24. ₦965.75 from Sept. 15, 1904, to Oct. 6, 1908, at 10% .
25. ₦645.60 from Dec. 14, 1906, to June 4, 1908, at 9% .

The work can sometimes be shortened by cancelation.

Find the interest on ₦326.40 for 8 mo. 10 da. at $4\frac{1}{2}\%$.

$$8 \text{ mo. } 10 \text{ da.} = 250 \text{ da.} = \frac{25}{12} \text{ yr.}$$

$$4\frac{1}{2}\% = \frac{9}{20}\% = \frac{9}{2000}$$

$$\frac{\text{₦}326.40 \times 9 \times 25}{2000 \times 12} = \text{₦}10.20, \text{ interest.}$$

26. Find the interest on ₦475.60 for 6 mo. 20 da. at 9% .
27. Find the interest on ₦725 for 6 mo. 6 da. at 6% .
28. Find the interest on ₦128.40 for 9 mo. 15 da. at 12% .
29. Find the interest on ₦225 for 9 mo. 18 da. at 8% .

Twelve Per Cent Method

129. Written.

When the rate is 12% , we first find the interest on ₦1, then multiply this by the principal considered as an abstract number.

At 12% , the interest on ₦1 for 1 yr. is ₦.12, or ₦.01 for 1 mo. The interest on ₦1 for 1 da. = $\frac{1}{30}$ of ₦.01, or ₦.000 $\frac{1}{3}$.

Find the interest on ₱144.60 for 2 yr. 5 mo. 25 da. at 12%.

2 yr. 5 mo. = 29 mo.

The interest on ₱1 for 29 mo. = $29 \times ₱.01 = ₱.29$.

The interest on ₱1 for 25 da. = $25 \times ₱.000\frac{1}{3} = ₱.008\frac{1}{3}$.

The interest on ₱1 for 2 yr. 5 mo. 25 da. = ₱.298 $\frac{1}{3}$.

The interest on ₱144.60 is $144.60 \times ₱.298\frac{1}{3}$, or ₱43.09.

Notice that 12% annually is the same as 1% per month.

Find the interest at 12% on:

1. ₱460 for 2 yr. 3 mo. 12 da.
2. ₱406.20 for 3 yr. 2 mo. 27 da.
3. ₱833.40 for 9 mo. 10 da.
4. ₱507.60 for 124 da.
5. ₱240 from June 20, 1907, to Oct. 10, 1909.
6. ₱822.50 from Aug. 17, 1907, to May 12, 1909.
7. ₱1240 from Nov. 25, 1907, to June 16, 1909.
8. ₱675 from July 15, 1906, to Jan. 6, 1908.

The 12% method is given instead of the 6% method because 12% is a very common rate in the Philippine Islands. If the 6% method is preferred, the substitution can easily be made in the explanations on this page, and the same problems used.

To use the 12% method for other rates, divide the interest at 12% by 12 to obtain the interest at 1%, then multiply the quotient by the given rate.

The interest at 7% is $\frac{7}{12}$ of the interest at 12%; at 5% = $\frac{5}{12}$; at 3% = $\frac{1}{4}$; at 4% = $\frac{1}{3}$; at 6% = $\frac{1}{2}$; at 8% = $\frac{2}{3}$; at 9% = $\frac{3}{4}$; at 10% = $\frac{5}{6}$; etc.

Find by the 12% method the interest on:

9. ₱246 for 9 mo. 24 da. at 8%.
10. ₱810 for 1 yr. 7 mo. 18 da. at 4%.
11. ₱375 for 2 yr. 24 da. at 7 $\frac{1}{2}$ %.

12. ₦642.60 for 3 yr. 10 mo. 15 da. at 10%.
13. ₦982.50 for 2 yr. 5 mo. 10 da. at $4\frac{1}{2}\%$.
14. ₦450.60 from Oct. 1, 1902, to May 1, 1908, at 5%.
15. ₦625.50 from March 26, 1904, to July 1, 1908, at 9%.
16. ₦322.50 from Feb. 25, 1907, to Oct. 7, 1909, at 11%.

Accurate Interest

130. Written.

In computing **accurate** or **exact** interest, the exact number of days between dates is used and 365 days are considered a year.

Exact interest is used by the United States Government and by banks.

Find the exact interest on ₦730 from April 10 to July 14, at 5%.

The exact difference in time is 95 days

$$\frac{730 \times 5 \times 95}{100 \times 365} = ₦9.50, \text{ interest.}$$

(see page 66).

Find the exact interest on :

1. ₦150 for 73 da. at 8%.
2. ₦219 for 55 da. at 10%.
3. ₦438 for 93 da. at 5%.
4. ₦350 for 146 da. at 9%.
5. ₦43.80 for 85 da. at 6%.
6. ₦625 for 60 da. at 4%.
7. ₦1250 for 45 da. at $7\frac{1}{2}\%$.
8. ₦87.60 for 105 da. at 7%.
9. ₦560 from April 10 to July 24 at 10%.
10. ₦875 from May 15 to Aug. 19 at $4\frac{1}{2}\%$.
11. ₦416.50 from June 17 to Sept. 5 at 8%.

When will a 90-day note dated June 15 be due?

90 days less the number of days left in June (15)
 90 da. - 15 da. = 75 da. is 75 days. 75 days less the number of days in July
 75 da. - 31 da. = 44 da. (31) is 44 days. 44 days less the number of days
 44 da. - 31 da. = 13 da. in August (31) is 13. Hence the note will be due
 Sept. 13.

For the following notes, find the exact interest and the date when due:

12. ₱1000 dated April 10, due in 60 da., interest at 8%.
13. ₱1460 dated Feb. 21, 1908, due in 30 da., interest at 10%.
14. ₱3000 dated May 15, due in 90 da., with interest at 12%.
15. ₱7500 dated Dec. 26, 1907, due in 40 da., interest at 8%.
16. ₱2500 dated Oct. 16, 1907, due in 120 da., interest at 6%.
17. ₱50,000 dated May 26, due in 30 da., with interest at 8%.
18. ₱73,000 dated April 1, due in 60 da., with interest at 6%.

Problems in Simple Interest

131. Written.

To find the rate ; given the principal, interest, and time.

At what rate must ₱1800 be loaned for 2 yr. 6 mo. 15 da. to gain ₱366?

A rate of 1% gains ₱45.75 in the given time.

₱366 contains ₱45.75 8 times.

Therefore a rate of $8 \times 1\%$, or 8%, will gain ₱366.

To find the rate, divide the given interest by the interest on the given principal for the given time at 1%.

Find the rate at which:

1. ₱750 will produce ₱67.50 interest in 1 yr. 6 mo.
2. ₱2000 will produce ₱105 interest in 9 mo. Analyze.
3. ₱1260 will produce ₱283.50 interest in 4 yr. 6 mo.
4. ₱2520 will produce ₱26.88 interest in 96 da. Analyze.
5. ₱2400 will produce ₱262.60 interest in 1 yr. 8 mo. 6 da.
6. ₱6300 will produce ₱798 interest in 1 yr. 7 mo.
7. ₱5400 will produce ₱56.25 interest in 75 da.
8. ₱2000 will amount to ₱2800 in 3 yr. 4 mo. Analyze.

The interest is ₱2800 - ₱2000, or ₱800.

9. ₦3672 will amount to ₦5615.10 in 5 yr. 3 mo. 15 da.
10. ₦4860 will amount to ₦6551.28 in 3 yr. 10 mo. 12 da.
11. ₦600 will double itself in 10 yr. Analyze.
12. ₦2988 will amount to ₦4935.18 in 10 yr. 10 mo. 10 da.

132. Written.

To find the time; given the principal, interest, and rate.

In what time at 9% will ₦4000 gain ₦1185 interest?

The interest on ₦4000 for 1 yr. at 9% is ₦360.

₦1185 contains ₦360 $3\frac{1}{4}$ times.

Therefore the required time is $3\frac{1}{4} \times 1 \text{ yr.} = 3\frac{1}{4} \text{ yr.} = 3 \text{ yr. } 3 \text{ mo. } 15 \text{ da.}$

To find the time, divide the given interest by the interest on the given principal for 1 yr. at the given rate.

Find the time in which:

1. ₦600 will produce ₦104 interest at 8%. Analyze.
2. ₦1000 will produce ₦180 interest at 4%.
3. ₦320 will produce ₦80.80 interest at 6%.
4. ₦3600 will produce ₦485 interest at 5%.
5. ₦400 will produce ₦133.20 interest at 12%.
6. ₦800 will amount to ₦925 at 5%. Analyze.
7. ₦3000 will amount to ₦3112 at 6%.
8. ₦720 will amount to ₦979.20 at 10%.
9. ₦600 will amount to ₦900 at 8%.
10. ₦1200 will double itself at 10%. At 12%.
11. In how many years will any principal treble itself at 8%?
12. I borrowed ₦540 at 6% and kept it until it amounted to ₦632.88. How long did I keep it? Analyze.
13. When will ₦600, put at interest at 10%, June 10, 1906, amount to ₦737.50?

133. Written.

To find the principal; given the interest or amount, time, and rate.

What principal will produce ₱112 interest in 2 yr. 4 mo. at 6 % ?

The interest on ₱1 for 2 yr. 4 mo. at 6% is ₱.14.

₱112 contains ₱.14 800 times.

Therefore the required principal is $800 \times ₱1$, or ₱800.

To find the principal, divide the given interest by the interest on ₱1 for the given time at the given rate.

What principal will produce:

1. ₱5.25 interest in 1 yr. 9 mo. at 6 % ?
2. ₱88 interest in 6 yr. 8 mo. at 6 % ? Analyze.
3. ₱10.25 interest in 60 da. at $7\frac{1}{2}$ % ?
4. ₱107.80 interest in $3\frac{1}{2}$ yr. at 8 % ? Analyze.
5. ₱856.26 interest in 3 yr. 6 mo. 18 da. at 9 % ?
6. ₱46.50 in 93 da. at 12 % ? Analyze.
7. ₱784.32 interest in 1 yr. 5 mo. 6 da. at 12 % ?
8. ₱150 interest in 12 yr. 6 mo. at 8 % ?
9. ₱490.50 interest in 4 yr. 6 mo. 15 da. at 10 % ?

What principal will amount to ₱752.40 in 2 yr. 4 mo. at 6 % ?

The amount of ₱1 for 2 yr. 4 mo. at 6% is ₱1.14.

₱752.40 contains ₱1.14 660 times.

Therefore the required principal is $660 \times ₱1$, or ₱660.

What principal will amount to:

10. ₱2300 in 3 yr. 9 mo. at 4 % ? Analyze.
11. ₱1094.66 in 1 yr. 3 mo. 18 da. at 9 % ?
12. ₱361.28 in 2 yr. 1 mo. 24 da. at 6 % ?
13. ₱628.80 in 7 mo. 6 da. at 8 % ? Analyze.
14. ₱323 in 4 yr. 10 mo. 12 da. at 6 % ?

PROMISSORY NOTES

134. Oral.

A **promissory note** is a written promise made by one person to pay another a certain sum of money at a definite time.

The **maker** of the note is the person who promises to pay.

The **payee** is the person to whom the note is payable.

The **holder** of a note is the owner. He may or may not be the payee.

The sum named in the note to be paid is the **face**.

A **negotiable** note is one that can be sold by the holder. A note is **non-negotiable** if it is made payable to the *payee only*.

A note is said to **mature** on the day on which it is due.

P 1000.00 -----	Manila, P. I., Dec. 27, 1909 -----
Three months after date I promise to pay to -----	
Gil Lopez, or order, One thousand and $\frac{no}{100}$ Pesos -----	
at the International Banking Corporation, Manila, P. I., interest at 8% per annum. Value received.	
Juan Carlos.	

1. Who is the maker of the above note? The payee?
2. What is the face? The date? When is the note due?
3. Is it negotiable? What is the amount of the note?

If the above note contained the words "Gil Lopez, or bearer," it could be collected by any one holding it lawfully.

An **indorser** is a person who writes his name across the back of the note.

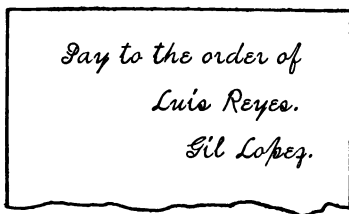
INDORSEMENT IN BLANK



The note on page 122 will become payable to bearer if Gil Lopez, the payee, indorses it, that is, writes his name across the back of it. In doing this, Gil Lopez becomes responsible for the payment of the note if Juan Carlos fails to pay it. If Gil Lopez wishes to avoid responsibility for the

payment of the note, he will write the words "without recourse" over his name.

INDORSEMENT IN FULL



If Gil Lopez sells this note to Luis Reyes, he may indorse it like this. Then Mr. Reyes may collect it or he may sell it by indorsing it to some one else.

Demand notes are payable on demand and are written, "On demand I promise to pay," etc.

135. Written.

1. Write a negotiable note for ₱460; date, to-day; time, 6 mo.; maker, yourself; payee, Manuel Robles; interest, 8%.
 2. Write an indorsement in full on the note in No. 1, which is sold to José Ramirez.
 3. Write a non-negotiable demand note for ₱825; maker, yourself; payee, Ramon Flores; no interest.
 4. Write two indorsements in full and one in blank on the note in No. 3, which is sold three times.
 5. Write a negotiable, 90-day note for ₱312.50, interest at 9%, supplying the date and the names of the maker and payee.
- If a firm, or company, gives a **joint and several note**, the members of the firm as individuals are responsible for the payment of the note if for any reason the firm fails to pay it.

A JOINT AND SEVERAL NOTE

₱ 1000.00 -----	Manila, P. I., May 29, 1908 -----
<p><i>Thirty</i> days after date, for value received, ^{we} jointly and severally promise to pay the</p> <p style="text-align: center;">International Banking Corporation, Manila, P. I.,</p> <p>the sum of <u>One thousand</u> ^{no}/₁₀₀ Pesos,</p> <p>with interest at the rate of <u>8</u> per cent per annum from maturity until paid, and <u>10</u> per cent of the principal in addition thereto for costs of collection if not paid at maturity.</p> <p>Payable at the office of the INTERNATIONAL BANKING CORPORATION, Manila, P. I.</p> <div style="text-align: right; margin-top: 20px;"> <i>J. D. Parker.</i> ----- </div> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div> No. <u>1009</u> Due <u>June 28, 1908.</u> ----- </div> <div> <i>R. L. Reed.</i> ----- </div> </div>	

6. Write a joint and several, negotiable note for ₱675.50; time, 90 days; makers, yourself and Pablo Cortez; payee, Hugo Torres; interest, 1 % per month.

7. Indorse the note in No. 5, which is sold to Fidel Pilar and by him to David Domingo.

PARTIAL PAYMENTS

136. Written.

Sometimes a borrower, instead of paying the whole note at one time, makes **partial payments**.

They are usually indorsed, with the dates at which they are made, on the back of the note.

The **merchants' rule** is commonly used for computing the amount due, when the time is one year or less.

The following is the **merchants' rule** :

Find the amount of the entire debt at the date of settlement.

Find the amount of each payment at the date of settlement.

Subtract the sum of the payment amounts from the amount of the debt.

A note for ₱ 1000 dated Jan. 1, 1907, had the following partial payments indorsed on it: April 1, ₱ 200; July 1, ₱ 300; Oct. 1, ₱ 250. How much was due Dec. 1, 1907, with interest at 12 % ?

₱ 1000 in 11 mo. at 12 % amounts to	₱ 1110
₱ 200 in 8 mo. at 12 % amounts to	₱ 216
₱ 300 in 5 mo. at 12 % amounts to	₱ 315
₱ 250 in 2 mo. at 12 % amounts to	₱ 255
Sum of payment amounts	786
Amount due Dec. 1, 1907	₱ 324

Write out a note for each of the following, indorse the payments, and find the amount due :

1. Date, June 1, 1907. Face, ₱ 2400. Interest at 10 %. Indorsements : Sept. 16, ₱ 400; Dec. 1, ₱ 300; Feb. 16, 1908, ₱ 340. What was due April 1, 1908 ?

2. Face, ₱ 600. Date, Feb. 1, 1909. Interest at 8 %. Indorsements : April 13, ₱ 150; June 1, ₱ 180; Aug. 1, ₱ 100. What was due Dec. 1, 1909 ?

3. Face, ₱ 800. Date, Jan. 5, 1908. Interest at 9 %. Indorsements : April 5, ₱ 120; June 20, ₱ 240; Aug. 5, ₱ 210. What was due Oct. 5, 1908 ?

4. Face, ₱ 900. Date, July 10, 1907. Interest at 12 %. Indorsements : Sept. 25, ₱ 200; Dec. 10, ₱ 240; Feb. 25, 1908, ₱ 180. What was due June 10, 1908 ?

5. Date, Aug. 6, 1907. Face, ₱1200. Interest at 6%. Indorsements: Nov. 24, ₱300; Jan. 12, 1908, ₱240; March 30, ₱480. What was due July 24, 1908?

6. Date, Sept. 15, 1906. Face, ₱720. Interest at 12%. Indorsements: Nov. 21, ₱150; Jan. 27, 1907, ₱192; April 9, ₱252. What was due Aug. 27, 1907?

7. Face, ₱3000. Date, May 10, 1907. Interest at 9%. Indorsements: Sept. 22, ₱660; Jan. 16, 1908, ₱750. What was due Feb. 4, 1908?

COMPOUND INTEREST

137. Written.

If I have ₱200 deposited in the Philippine Postal Savings Bank for 1 yr., I am entitled to interest on this sum at $2\frac{1}{2}\%$ for 1 yr., or ₱5.00. If I do not wish to use this interest, it is added to my ₱200 deposit and together they draw interest for the second year.

Compound interest is interest on the principal and on unpaid interest, which is added to the principal at the end of regular interest periods. Interest is usually compounded annually, semi-annually, or quarterly.

Find the compound interest on ₱1000 for 1 yr. 3 mo. at 8%, interest compounded semi-annually.

₱1000 in $\frac{1}{2}$ yr. at 8% amounts to ₱1040.

₱1040 in $\frac{1}{2}$ yr. at 8% amounts to ₱1081.60.

₱1081.60 in 3 mo. at 8% amounts to ₱1103.23.

₱1103.23 - ₱1000 = ₱103.23, compound interest for 1 yr. 3 mo.

Find the compound interest on:

1. ₱1000 for 5 yr. at 8%, payable annually.
2. ₱800 for 3 yr. 4 mo. 15 da. at 12%, payable annually.
3. ₱6000 for 6 yr. at 6%, payable annually.
4. ₱3000 for 2 yr. 6 mo. at 10%, payable semi-annually.

5. ₱4000 for 2 yr. 5 mo. at 12%, payable semi-annually.
6. ₱750 for 1 yr. 3 mo. at 8%, payable quarterly.
7. ₱1000 for 1 yr. 8 mo. at 12%, payable quarterly.
8. ₱640 for 1 yr. 9 mo. 24 da. at 4%, payable semi-annually.

BANK DISCOUNT**138. Written.**

Bank discount is simple interest, collected in advance, upon the **maturity value** of a note.

The maturity value is the amount due at maturity. If a note bears no interest, the maturity value is the same as the face of the note. If a note bears interest, the maturity value is the face plus the interest.

The exact number of days from the date of discount to the date of maturity is the **term of discount**.

The amount due at maturity less the bank discount is called the **proceeds**.

A few banks use exact interest in computing bank discount; that is, the year is counted as 365 days in finding the interest for the term of discount.

₱ 1000.00 -----	Manila, P. I., April 1, 1907 -----
Three months -----	after date, for value received, I -----
promise to pay -----	Manuel Santos, ----- or order,
One thousand and ~~~~~ ----- no 100 Pesos	
at the Hongkong & Shanghai Banking Corporation, with simple interest at 12%.	
Victorio Ramos.	

Find the date of maturity, term of discount, bank discount, and proceeds of the note on page 127, discounted May 8, 1908, at 10 %.

The date of maturity is 3 mo. after April 1, 1908, or July 1, 1908. The amount of the note at maturity is ₱1030 (simple interest). The term of discount is from May 8 to July 1, or 54 days.

The bank discount is the simple interest on ₱1030 for 54 days, at 10 %, or ₱15.45.

The proceeds are ₱1030 - ₱15.45, or ₱1014.55.

Find the date of maturity, the term of discount, and the proceeds of the following:

1. A note for ₱2000, dated July 1, 1907, due in 30 da., without interest, discounted July 1 at 9 %.
2. A 60-day note for ₱1500, without interest, dated April 10, 1908, discounted May 10 at 8 %.
3. A 30-day note for ₱800, without interest, dated Sept. 20, 1907, discounted Sept. 30 at 10 %.
4. A 90-day note for ₱7200, without interest, dated June 1, 1908, discounted July 12 at 12 %.
5. A note for ₱3600, dated Aug. 1, 1906, due in 4 mo., with simple interest at 9 %, discounted Sept. 15 at 10 %.
6. A note for ₱840, with simple interest for 3 mo. at 8 %, dated May 1, 1908, discounted June 1 at 8 %.
7. A 120-day note for ₱4500, with simple interest at 6 %, dated Feb. 12, 1909, discounted April 1 at 9 %.
8. A 20-day note for ₱12,000, with simple interest at 12 %, dated June 20, 1907, discounted June 30 at 10 %.
9. A note for ₱365, without interest, due in 3 mo., dated Nov. 20, 1907, discounted Jan. 1, 1908, at 6 %.
10. A note for ₱5000, due in 2 mo., dated Sept. 1, 1909, without interest, discounted Sept. 1 at 8 %.

139. Oral.

The person who wishes to place money in a **Postal Savings Bank** fills out a **deposit slip** like the one below and presents it with the money or stamp cards to the postmaster. He receives a preliminary receipt, and is told when to call for his deposit book, which will be sent from the central office at Manila.

No. 35627

Philippine Postal Savings Bank

DEPOSIT SLIP

Cavite, P. I., May 30, 1907


Number of Deposit Book 3678

Name of Depositor Tomas Gamboa

Residence Cavite, P. I.

Write in words as well as in figures the amount to be deposited.

	Pesos	Cvos.
Stamps _____		
Silver <u>Fifteen pesos</u>	<u>15</u>	<u>00</u>
Bills _____		
Checks _____		
Total _____		

THUMB MARK


After the depositor has received his deposit book, all new deposits are entered in it by the postmaster at the time the deposit is made. In due time the depositor will receive for each deposit a **certificate of deposit** from Manila as follows :


Philippine Postal Savings Bank	
<p style="text-align: center;">This is to certify that the sum of</p> <p style="text-align: center;"><i>Fifteen and</i> ~~~~~ <i>no</i> Pesos</p> <p style="text-align: center;">(P $15 \frac{00}{100}$), deposited with the Postmaster at</p>	<p><i>Cavite</i></p>
<p style="text-align: center;"><i>May 30</i></p> <p style="text-align: center;">-----, 1907, has this date been entered to the credit of the account</p> <p style="text-align: center;">of <i>Tomas Gamboa</i>, residence <i>Cavite</i>, P. I., upon the books of the</p> <p style="text-align: center;">Central Office at Manila, making the balance to the credit of his account P $86 \frac{00}{100}$</p>	
<p>No. of Deposit Book <i>3678</i></p>	
<p>Manila, <i>May 31</i></p> <p style="text-align: center;">-----, 1907</p>	
<p><i>Ben F. Wright.</i></p> <p>-----</p> <p>Chief, Postal Savings Bank Division.</p>	

To encourage the saving of small sums of money, especially by children, 5-, 10-, and 20-centavo Savings Bank stamps have been prepared. These stamps are sold by postmasters and may be pasted upon cards furnished for the purpose. When the spaces on a card are filled with the proper stamps to the amount of one peso, the card may be deposited as one peso.

The deposit books, stamp cards, and all services connected with the Bank are supplied by the government free of charge. Interest is paid on the lowest monthly balance, not exceeding ₱ 1000, at $2\frac{1}{2}\%$ per annum.

If possible, obtain the various Postal Savings Bank forms and explain to the pupils the use of each.

Money may be withdrawn from the Bank twice during each month by making application for a withdrawal and signing a receipt like the following :

PHILIPPINE POSTAL SAVINGS BANK.	
<i>Cavite</i> , P. I., <i>May 5</i> , 1907	
RECEIVED from <i>E. T. Spillman</i>	
the sum of <i>Twenty and</i> $\frac{no}{100}$ Pesos	
(P----- <i>20</i> $\frac{00}{100}$) as a withdrawal from my Postal Savings Bank deposits.	
Deposit Book No. <i>3678</i>	<div style="text-align: center;"> <i>Tomas Gamboa.</i> (Signature.) </div> <div style="text-align: center; margin-top: 20px;"> <i>Cavite, P. I.</i> (Residence.) </div>
To be forwarded as a voucher with Postmaster's monthly statement of account.	<div style="border: 1px solid black; padding: 5px; text-align: center;"> THUMB  MARK </div>

Impress upon the pupils the necessity of saving. Show them that every person who wishes to rise above his present condition must have a definite idea as to what he desires to make of himself, and must make his earnings assist in carrying out his plans.

140. Written.

The Postal Savings Bank pays interest on the lowest monthly balance, not exceeding ₱ 1000, at $2\frac{1}{2}\%$ per annum.

A deposit must be made on the first day of the month in order to draw interest for that month. In closing an account, interest is computed to the end of the previous month. Interest is credited to the account on the 30th of June each year.

1. If a man deposits in the Postal Savings Bank ₱ 500, July 1, 1907, what will be due him July 1, 1910, with interest compounded annually at $2\frac{1}{2}\%$?

2. When the old Mexican currency was called in, it was estimated that ₱10,000,000 were buried in the ground. If this amount had been deposited in a Postal Savings Bank for three years, beginning July 1, what would the interest have amounted to, compounded annually at $2\frac{1}{2}\%$?

PHILIPPINE POSTAL SAVINGS BANK

Deposit Book No. **3678**, in account with

Tomas Gamboa

DATE	PLACE	WITHDRAWAL	DEPOSIT	BALANCE
1907				
2/1	Carite	E. T. S.	500 -	500 -
3/1	Manila	O. M. S.	120 -	620 -
3/8	Carite	540 -	E. T. S.	80 -
5/4	"	20 -	E. T. S.	60 -
5/10	"	E. T. S.	11 -	71 -
5/30	"	E. T. S.	15 -	86 -
FORWARDED				

In this account the ₱500 deposited February 1 draws interest at $2\frac{1}{2}\%$ through February. ₱80, the lowest monthly balance for March, draws interest through March. The lowest monthly balance for April is ₱80, and for May ₱60.

The interest on ₱500 for 1 mo., ₱80 for 1 mo., ₱80 for 1 mo., and ₱60 for 1 mo. is the same as the interest on ₱720 for 1 mo., or ₱1.50.

3. If I deposit ₱1000 in the Postal Savings Bank July 1, 1906, and draw out ₱500 July 1, 1907, how much will be due me July 1, 1908?

STATEMENT

DATE	WITHDRAWAL	DEPOSIT	BALANCE
1907			
Jan. 1		P 500	P 500
Feb. 1	P 100		400
Mar. 1		200	600
May 10		100	700
June 1	100		600

4. What interest should be credited on the above statement June 30, 1907?

Arrange each of the following as in the statement above and find the amount due July 1, 1908, interest at $2\frac{1}{2}\%$ on the lowest monthly balance:

5. *Deposits:* July 1, 1907, P 300; Oct. 1, P 200; Feb. 1, 1908, P 400; April 1, P 250. *Withdrawals:* Sept. 1, 1907, P 100; March 1, 1908, P 150.

6. *Deposits:* Jan. 1, 1908, P 450; March 20, P 240; May 25, P 360. *Withdrawals:* Feb. 8, P 80; April 10, P 120; June 5, P 50.

7. *Deposits:* Sept. 1, 1907, P 280; Nov. 25, P 220; Feb. 1, 1908, P 335; April 23, P 180. *Withdrawals:* Dec. 12, 1907, P 75; March 10, 1908, P 120; May 15, P 60.

8. *Deposits:* Aug. 15, 1907, P 125; Sept. 1, P 300; Nov. 20, P 250; March 1, 1908, P 320. *Withdrawals:* Oct. 10, 1907, P 75; Jan. 5, 1908, P 100; June 12, P 125.

9. *Deposits:* Oct. 1, 1907, P 60; Nov. 12, P 50; Jan. 9, 1908, P 100. *Withdrawals:* Oct. 11, 1907, P 25; Nov. 1, P 11; April 3, 1908, P 20.

10. *Deposits:* July 1, 1907, P 250; Aug. 1, P 20; Sept. 5, P 25; Oct. 1, P 25; Nov. 1, P 30; Dec. 15, P 35; Jan. 2, 1908, P 10; Feb. 20, P 20; April 1, P 30; May 12, P 40; June 1, P 35. *Withdrawals:* none.

GENERAL REVIEW

141. Oral.

Give oral analysis of each of the following:

1. If 3 men can do a piece of work in 12 days, how long will it take 4 men to do it?
2. At ₱.12½ a kilo, what will 64 kilos of potatoes cost?
3. A boy spent $\frac{4}{5}$ of his money and had 80 centavos left. How much had he at first?
4. If .3 of a ton of coal costs ₱ 3.60, what will 10 tons cost?
5. If a man can do $\frac{3}{8}$ of a piece of work in 1 day, how long will it take him to do one half of it?
6. 62 is $\frac{2}{3}$ of what number? 35 is $\frac{7}{8}$ of what number?
7. A boy sold a knife for ₱.80, which was $\frac{4}{5}$ of its cost. How much did he lose? Analyze.
8. When it is noon in Manila, what time is it 75 degrees west of Manila?
9. If 7 meters of cloth cost ₱ 2.80, what will 2½ meters cost?
10. If a boy bought 100 oranges at the rate of 2 for 3 centavos, and sold them at the rate of 2 for 5 centavos, how much did he gain?
11. What will 2500 bricks cost at ₱ 22 a thousand?
12. If a boy earns ₱ 5 a week and spends each week ₱ 3.50, how many weeks will it take him to save ₱ 15? Analyze.
13. A man sold 240 oranges at a profit of 6 centavos per dozen. What was his entire profit?
14. Multiply .4 by .7; 8 by .6; 2.5 by 4; .12 by 10.
15. 20 is 10% of what number? 12½% of what number?
16. $\frac{1}{2}$ is what per cent of 3? Of 2½? Of $\frac{1}{8}$? Of 10?
17. 15 is $\frac{1}{4}$ more than what number?
18. At ₱ 36 a dozen, what will 40 hats cost?

19. At ₱.12 $\frac{1}{2}$ a meter, how many meters of cloth can I buy for ₱6?
20. How many cu. cm are there in a block 20 cm by 10 cm by 4.5 cm?
21. What is the specific gravity of iron if a bar containing 100 cu. cm weighs 780 grams?
22. How many seconds are there in half an hour?
23. What is the area of a triangle whose base is 42 m, altitude 20 m?
24. What is the area of a cube whose edge is 5 cm?
25. At ₱.20 a sq. m, what will a roll of sawali cost that is 15 m long and 3 m wide?
26. What will 6200 nipas cost at ₱4 a thousand?
27. Allowing 800 bricks to the cubic meter, how many bricks will it take to build a wall 10 m long, 2 m high, and .5 m thick?
28. How many meters, B. M., are there in 10 boards, each 8 m long, .25 m wide, and 2 cm thick?
29. A dealer sold a suit of clothes for ₱4.20 above cost at a profit of 25%. What was the cost? Analyze.
30. If a man's salary is ₱600 a year, how much should he receive for 4 $\frac{1}{4}$ months' work?
31. If $\frac{2}{5}$ of a meter of cloth costs ₱.80, what will 6 $\frac{1}{2}$ meters cost? Analyze.
32. What is the gain % when eggs bought for ₱.24 a dozen are sold for ₱.30 a dozen? Analyze.
33. I sold a cow for ₱60 and gained 20%. Find the cost.
34. If a boy can ride a bicycle at the rate of 30 Km an hour, how long will it take him to ride 7 $\frac{1}{2}$ Km? Analyze.
35. A dealer sold a watch for ₱35 and thus lost 12 $\frac{1}{2}$ %. What was the cost? Analyze.

36. 60 is $33\frac{1}{3}\%$ less than what number? $33\frac{1}{3}\%$ more than what number?

37. What is $66\frac{2}{3}\%$ of ₱666? 125% of ₱40? $37\frac{1}{2}\%$ of ₱80?

38. A farmer raised 100 hektoliters of rice from 2 hektoliters of seed. What per cent of the crop was the seed?

39. What is the rate of commission when an agent receives ₱40 for selling 20 carabaos at ₱100 each?

40. At $2\frac{1}{2}\%$, what is the commission for selling ₱2200 worth of sugar?

41. What is the net amount of a bill of goods listed at ₱400 and discounted 22%?

42. If I insure a crop worth ₱4000 for half its value at $\frac{1}{2}\%$ a month, how much premium must I pay in 3 months?

43. What single rate of discount is equivalent to 20% and 10% off?

44. What is the amount of insurance when a premium of ₱150 is paid at a rate of $1\frac{1}{2}\%$?

45. What is the forestry tax on 440 cu. m of timber at ₱2.50 per cubic meter?

46. At 2% commission, an agent received ₱50 for selling salt. What was the value of the salt sold? Analyze.

47. At 20% ad valorem, the duty on a bill of books was ₱40.50. What was the amount of the bill?

48. At ₱21.10 a thousand, what will be the annual premium on a ₱6000 life insurance policy?

49. What is the simple interest on ₱400 for 2 yr. 6 mo. at 8%?

50. In what time will ₱500 at 8% produce ₱130 interest?

51. A factory worth ₱15,000 is insured for $\frac{3}{4}$ of its value at $1\frac{1}{8}\%$. What is the premium?

52. At what rate will ₱200 produce ₱60 interest in 3 yr.?

142. Written.

1. Multiply 10.0425 by 21.44.
2. Divide .0121155 by 10.25.
3. $\frac{2\frac{1}{2}}{1\frac{2}{3}} \times \frac{\frac{3}{10} \text{ of } \frac{5}{9}}{2\frac{1}{2} \times \frac{7}{10}} + \frac{3}{1\frac{1}{8}} = ?$
4. If $5\frac{1}{2}$ Ha of land cost ₱677 $\frac{7}{10}$, what will $8\frac{1}{2}$ Ha cost? Analyze.
5. When maize is worth ₱2.25 per Hl, and rice is worth ₱8.50 per Hl, how many Hl of rice should be exchanged for 42.5 Hl of maize?
6. A boy buys 90 oranges at the rate of 2 for 5 centavos, and 90 at the rate of 3 for 4 centavos. If he sells them all at 2 centavos each, what will be his gain? His gain per cent?
7. If I pay ₱167.75 for $5\frac{1}{2}$ quintals of hemp, how many quintals can I buy for ₱747.25? Analyze.
8. A can do a piece of work in 10 days, B can do it in 15 days, and C in 20 days. In what time can they do it together?
9. What is the width of a rectangular piece of land containing 4.5 Ha, if it is 250 m long?
10. If $\frac{3}{8}$ of a quintal of maguey costs ₱13.50, how many quintals can I buy for ₱729? Analyze.
11. If a boy breathes in $\frac{3}{8}$ of a liter of air 18 times a minute, how many liters of air will he need in $2\frac{1}{2}$ hours?
12. If $\frac{5}{12}$ of a farm is worth ₱5275, what is $\frac{1}{16}$ of it worth?
13. What is the weight of the water that fills a tank 1.4 m long, 75 cm wide, and 60 cm deep?
14. What is the specific gravity of petroleum if 42.5 cu. dm of it weighs 34.85 Kg?
15. How many bottles, each holding $\frac{1}{8}$ of a liter, can be filled from 12 170-liter casks of oil?

16. At ₱ 220 per Ha, what will be the cost of a piece of land shaped like a trapezoid with parallel sides 460 m and 540 m respectively, and the distance between them 250 m?

17. A merchant bought 252 quintals of maguey at ₱ 21 per quintal. He sold $\frac{2}{3}$ of it at ₱ 24.50 per quintal. For how much per quintal must he sell the remainder to gain ₱ 966 on the whole?

18. If $\frac{1}{6}$, $\frac{2}{3}$, and $\frac{5}{6}$ of a number added together make 255, what is the number? Analyze.

19. What part of a hektoliter of rice, at ₱ 9.35 per hektoliter, will pay for $\frac{2}{3}$ of a quintal of sugar at ₱ 8.50 per quintal?

20. A man spent $\frac{3}{4}$ of his money for a farm, $\frac{2}{3}$ of the remainder for a mill, and had ₱ 600 left. How much money had he at first?

21. If 11 pigs cost ₱ 30 $\frac{1}{4}$, how many can be bought for ₱ 68 $\frac{3}{4}$?

22. What will 39 $\frac{2}{3}$ kilos of sugar cost at the rate of 4 $\frac{1}{2}$ kilos for ₱ 1? Analyze.

23. A and B can do a piece of work in 10 days, B and C in 12 days, and A and C in 15 days. How long will it take them all working together to do the work? How long will it take each working alone to do it?

24. If a man earns ₱ 8.10 a week and spends each week ₱ 5.85, how long will it take him to save ₱ 94.50?

25. How many liters of milk will weigh 61.8 Kg if the specific gravity of milk is 1.03?

26. What is the weight of a block of stone 1.6 m long, .75 m wide, and .6 m thick, if the sp. gr. of the stone is 2.8?

27. A cacao plantation has 75 rows of trees with 100 trees in each row, each tree yields 1.25 Kg, and the cacao is worth ₱ .96 per Kg. What is the value of the entire crop?

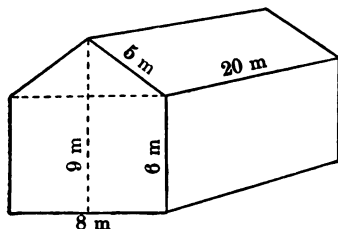
143. Written.

1. Find the weight of 1250 m of steel rods 2 cm square, if the specific gravity of steel is 7.8.

2. Making no allowance for openings, what length of sawali $2\frac{1}{2}$ m wide must I buy for the walls and ceiling of a house 12.5 m long, 5.4 m wide, and $2\frac{1}{2}$ m from floor to ceiling?

3. Find the cost of painting the sides, ends, and roof of this building at ₱.28 per square meter.

4. Allowing 45 bricks to the sq. m, what will be the cost of a brick walk 64 m long and 1.6 m wide, if the bricks cost ₱22.50 per 1000, and the laying ₱2.50 per 1000?



5. How many ft., B. M., are there in 420 boards 6 in. wide, 1 in. thick, and $14\frac{1}{2}$ ft. long?

6. Estimating .1 cu. m to the barrel, what is the weight of 560 barrels of cement, if the specific gravity of cement is 1.25?

7. Allowing 25 stones to the cu. m, ₱14.50 a hundred for the stones, ₱.90 per cu. m for mortar, and ₱7.50 a hundred for laying, what will it cost to build a stone wall 72 m long, 2.2 m high, and .5 m thick?

8. If one sheet of iron roofing will cover a net area of 1.37 sq. m, and 2 sheets are allowed for waste in cutting, how many 2.13-m sheets will it take to cover a roof composed of 4 triangles, each of which has a base 5.6 m long and an altitude of 3.9 m?

9. If each sheet in No. 8 weighs 13 Kg, what will the roofing cost at ₱19.50 per quintal?

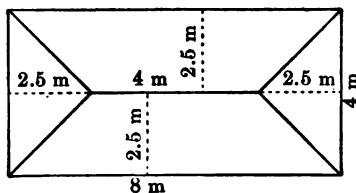
10. What is the weight of a concrete wall 4.4 m long, 2.5 m high, and .4 m thick, if the specific gravity of the concrete is 2.08?

11. At ₱58.50 per cu. m, what will be the cost of a piece of narra timber, 40 cm by 30 cm and 5.8 m long?

12. At ₱1.50 per meter, what will be the cost of 45 guijo joists, each 20 cm by 6 cm and 7 m long?

13. The specific gravity of lead is 11.35. Find the value of .04 cu. m of lead at ₱.21½ per kilo.

14. At the rate of 348 m per second, how long will it take sound to travel 5 Km?



15. Allowing 40 nipas to the sq. m, find the cost, at ₱3.80 per thousand, of the nipa necessary to cover this roof.

16. At ₱.14 per ft., B. M., find the cost of the following bill of lumber: 8 posts, 10 in. square, 18 ft. long; 20 beams, 8 in. by 3 in., 15 ft. long; 30 joists, 6 in. by 1.5 in., 20 ft. long; and 125 boards, 1 ft. wide, ½ in. thick, and 15 ft. long.

17. A schoolhouse 21 m long and 9 m wide has double sawali walls 3 m high around the outside, and two single sawali partitions 9 m long and 3 m high between the rooms. Allowing 15 sq. m for openings, find the number of sq. m of sawali used.

18. At the rate of 300,000 Km per second, how long would it take light to travel around the earth, 40,000 Km?

19. What is ¾ of a hektar of land worth, if ⅓ of a hektar is worth ₱37.50?

20. A deer is 128 m ahead of a dog. If the dog can run 1150 m in a minute and the deer 1110 m, in how many minutes can the dog overtake the deer?

21. An estate of ₱3480 was divided between two children. If the elder received 2½ times as much as the younger, what was the share of each? Analyze.

144. Written.

1. A house rents for ₱1050 a year, which is 14% of its value. What is the value of the house?

2. Mr. Robles sold a piano for ₱348.50 which was 85% of its cost. How much did he lose? Analyze.

3. A merchant has 1640 quintals of sugar. If he sells $\frac{1}{4}$ of it at one time and $\frac{3}{8}$ of the remainder at another time, what per cent of the whole will he have left?

4. If a man spends ₱172.50 and finds that he has 25% of his money left, how much had he at first? Analyze.

5. If a merchant sells $37\frac{1}{2}\%$ of his stock of goods for ₱7287, what is the value of the remainder?

6. A and B owned a sugar mill worth ₱10,360. If A's share was worth ₱4662, what per cent of the mill did B own?

7. A merchant hired a launch for 5 days, paying ₱50 a day. He found that he had paid $2\frac{1}{2}\%$ of its value. What was the value of the launch? Analyze.

8. A farmer sold 55 gantas of cacao for ₱1.20 per ganta. If this was 80% of his crop, what was the value of the remainder? Analyze.

9. A man owed ₱600. If he paid $\frac{1}{3}$ of it at one time and 25% of what remained at another time, what per cent of the debt does he still owe? Analyze.

10. A man spent 30% of his money for 25 hektoliters of rice at ₱6.60 per hektoliter. How much money did he have at first?

11. Mr. Santos bought a piece of land for ₱4375 and built a house on it at a cost of ₱625. He sold them both for what the land cost. What per cent did he lose?

12. Of 560 pupils who took an examination 448 passed. What per cent of them failed? Analyze.

13. A man sold 85 carabaos for ₱ 8318.10, which was 20 % more than they cost. What was the average cost of the carabaos?

14. I sold 20 liters of coconut oil for ₱ 8, which was 25 % more than it cost. Find the cost of the oil per liter.

15. A bookkeeper's salary is ₱ 800 per year. He pays 20 % of it for rent, 10 % for clothes, 5 % for books, and ₱ 160 for other expenses. What per cent of his salary has he left?

16. I took 35 liters of rice from a bag, which was 25 % more than what was left in the bag. How many liters did the bag contain at first? Analyze.

17. What per cent is gained by buying sugar at 10 % below market value and selling it at 10 % above market value?

18. A man paid ₱ 225 for a horse, which was 25 % more than he paid for a carromata. How much did he pay for both?

19. A merchant had 560 kilos of cacao. He sold $\frac{3}{8}$ of it at one time and 140 kilos at another. What per cent of the whole had he left? Analyze.

20. A drover sold 80 hogs for ₱ 1672, which was $37\frac{1}{2}$ % more than they cost. What was the average cost per head?

21. If a grocer buys coffee at ₱ 32 a hektoliter and sells it for ₱ .42 a liter, what is his gain %? Analyze.

22. A farmer raised 420 hektoliters of maize. He sold 220 hektoliters to A, $\frac{1}{8}$ of the remainder to B, and $\frac{1}{8}$ of what still remained to C. What per cent of the whole crop had he left?

23. A's salary is ₱ 360 a year. If this is 20 % more than $\frac{2}{3}$ of B's salary, how much is B's salary? Analyze.

24. In a certain province there were 3200 pupils. 80 of them were in the high school, four times as many were in the intermediate grades, and the rest were in the primary grades. What per cent of the whole number were in the primary grades?

145. Written.

1. If a man spends 57 % of his income and saves ₱537.50, what is his income? Analyze.

2. A man owns a farm worth ₱5000. His annual taxes are ₱37.50. How much must he make in order to have a net gain of $6\frac{1}{2}$ % from his farm each year?

3. What is the difference in liters between $\frac{3}{4}$ of a hektoliter and $\frac{3}{4}$ % of a hektoliter?

4. A house depreciated in value each year at the rate of 4 % of its value at the beginning of the year, and its value at the end of three years was ₱4423.68. What was its original value?

5. A grocer bought a basket of eggs containing 35 dozen, paying ₱.30 per dozen. He dropped the basket and broke $3\frac{1}{2}$ dozen. For how much per dozen must he sell the remainder to gain 20 % on the total cost?

6. A dealer bought ₱320 worth of shoes and sold them at a profit of 30 %. If he failed to collect 10 % of the selling price, what was his actual gain? What %?

7. A clerk's salary was decreased $3\frac{1}{2}$ % and was then ₱1158 a year. How much was it before the decrease?

8. An engineer's salary was increased 5 % and was then ₱2520. How much was it before the increase? Analyze.

9. If a man worked at a salary of ₱2.40 a day, spent 75 % of his salary for living expenses, and saved ₱180 in a year, how many days did he work?

10. A man owning $\frac{1}{2}$ of a store sold $\frac{3}{8}$ of his interest. What per cent of the store did he still own?

11. If water expands 10 % when it freezes, how much does ice contract when it melts? Analyze.

12. A merchant marked his goods at 25% above cost, and gave his customers a discount of 10%. What was his per cent of profit?

13. A man paid ₱3150 for a house and lot. If the cost of the lot was 25 % more than the cost of the house, what was the cost of each?

14. Find the trade discount on a bill of goods amounting to ₱400, discounts 30 %, 7 %, and 5 %.

15. What is the difference between a discount of 20 %, and two successive discounts of 10 % each, on a bill of ₱600?

16. The taxable property in a certain province is ₱1,200,000. What will be the tax on each ₱100 to raise ₱6000 for school purposes?

17. Decrease 820 by 50 % of itself; that result by 50 % of itself; and that result by 50 % of itself. The final result is what per cent of 820?

18. A schoolhouse is insured at $\frac{3}{8}$ %, the premium being ₱18. The face of the policy is $\frac{5}{8}$ of the value of the building. Find the value of the building.

19. A horse trader sold two horses at ₱72 each. On one he gained 20 % and on the other he lost 20 %. What did each horse cost? Analyze.

20. After deducting 15 % and 10 % from the marked price, I sold goods for ₱382.50. What was the marked price?

21. At what price must a dealer mark machinery that cost him ₱225, so as to give a discount of 10 % and still gain 10 %?

22. What is the rate of gain when eggs bought at ₱.02 $\frac{1}{2}$ each are sold for ₱.40 a dozen? Analyze.

23. A man deposited some money in a bank. Later he drew out 10 % of the amount, then 9 % of the remainder, and then 25 % of what was still in the bank. If the final remainder was ₱614.25, what was the original deposit?

146. Written.

1. What is the face of a policy when the premium at $2\frac{1}{2}\%$ is ₱17.50? Analyze.

2. A man pays ₱237.15 annually on an ₱8500 life insurance policy. What is the rate of premium per thousand?

3. In a certain municipality, the taxable property is assessed at ₱490,560. ₱1226.40 is levied for schools, ₱618.20 for other municipal expenses, and ₱1839.60 for provincial expenses. Find the rate of tax for each.

4. The tax levied in 1906 on the real estate in the city of Manila at $1\frac{1}{2}\%$ was ₱1,207,878.54. What was the assessed valuation of the real estate?

5. I sent my broker ₱1892.80 to invest in rice at ₱9.10 per hektoliter after deducting his commission of 4%. How many hektoliters did he buy?

6. Find the simple interest at 8% on a note for ₱375 dated June 17 and due Jan. 5, following.

7. Find the amount of a note for ₱2400 dated Aug. 5, 1906, and due July 29, 1907, at 6%.

8. Find the date when due and amount to be paid on a 90-day note for ₱260, dated May 23, 1909, with interest at 6%.

9. Write a 60-day promissory note for ₱100 payable to the order of Manuel Lopez, bearing 6% interest. By indorsement, make the note payable to Segundo Coneta.

10. What was the face of a note dated Sept. 10, 1908, bearing 12% interest, if the amount due July 16, 1909, was ₱495.90?

11. What was the face of a 30-day note bearing 6% interest, if the amount due at maturity was ₱251.25? Analyze.

12. At what rate will ₱660 amount to ₱839.30 in 2 yr. 8 mo. 18 da.? Analyze.

13. Find the amount of ₱265.50 at simple interest for 4 yr. 10 mo. 10 da. at 5 %.

14. What is the face of a note, if the interest for 1 yr. 6 mo. 15 da. at 8 % is ₱103.60? Analyze.

15. A note for ₱92.40 amounted to ₱112.27 in 3 yr. 7 mo. What was the rate? Analyze.

16. In what time will ₱975 amount to ₱1253.20, drawing simple interest at 8 %?

17. What principal will amount to ₱1860.75, drawing simple interest at $6\frac{1}{2}$ % from Oct. 28, 1904, to July 10, 1908? Analyze.

18. A note for ₱2500, dated Jan. 2, 1908, due in 6 mo., with interest at 8 %, was discounted at a bank April 9, 1908, at 10 %. Find the proceeds.

19. A 90-day note for ₱650, dated July 15, 1907, drawing simple interest at 8 %, was discounted at a bank, Sept. 1, 1907, at 10 %. Find the proceeds.

20. What principal loaned at 10 % from Jan. 2, 1906, to April 26, 1907, will produce ₱489.80 interest? Analyze.

21. At what rate will ₱2400 amount to ₱2979.60 in 3 yr. 5 mo. 12 da.?

22. In what time will ₱960 amount to ₱1148.80 at 8 %?

23. Find the compound interest on ₱8000 from June 6, 1907, to Aug. 21, 1908, at 8 %, payable semi-annually.

24. A man bought a carromata at 20 % and 5 % from the list price and sold it at 10 % and 5 % from the list price. If he sold it for ₱171, what did it cost? What was the gain %?

25. Mr. Mariano sold two sheep at ₱3 each. On one he gained 25 % and on the other he lost 25 %. How much did he gain or lose?

26. The interest on a certain sum is ₱54.80; the time, 2 yr. 3 mo. 12 da.; and the rate, 6 %. What is the principal?

27. At what rate will ₱7000 yield ₱1106 interest in 2 yr. 7 mo. 18 da.? Analyze.

28. Find the exact interest at 8% on a note of ₱720, dated Oct. 30, 1907, and paid March 13, 1908.

29. Find the compound interest on ₱2000 for 1 yr. 2 mo. 15 da. at 12%, interest payable quarterly.

30. Mr. Mendoza owned a half-interest in an estate. He sold 24% of his share for ₱4500. What was the value of the whole estate?

31. A man drew out 40% of his deposit in a bank. He spent ₱34, or $8\frac{1}{2}\%$ of what he drew out. What was his original deposit?

32. Find the amount of ₱500, deposited in the Postal Savings Bank July 1, 1903, interest compounded annually at $2\frac{1}{2}\%$ for 4 years.

33. A note for ₱2400, with interest at 8%, dated Feb. 6, 1907, had the following indorsements: May 6, ₱480; Aug. 6, ₱360; Oct. 6, ₱600. What was due Dec. 6, 1907?

34. July 9, 1907, ₱438 is loaned at 8%, exact interest. Find the amount due Nov. 1, 1907.

35. What is the difference between the exact interest and the ordinary interest on ₱4000 from July 1 to Nov. 1 at 6%?

36. On a note for ₱4800, with interest at 10%, dated June 12, 1907, were the following indorsements: Aug. 12, ₱960; Nov. 27, ₱1200; Feb. 27, 1908, ₱900. What was due May 12, 1908?

37. Find the amount due July 1, 1908, on the following Savings Bank account, interest at $2\frac{1}{2}\%$ on the lowest monthly balance: *Deposits*: July 1, 1907, ₱200; July 12, 1907, ₱250; Oct. 1, 1907, ₱47; March 25, 1908, ₱150. *Withdrawals*: Aug. 7, 1907, ₱50; Sept. 10, 1907, ₱45; Jan. 15, 1908, ₱32; June 8, 1908, ₱55.

EXAMINATION QUESTIONS

147. Written.

1. A merchant bought slates for ₱2.88 a dozen, and sold them at ₱.30 each. What was his gain per cent?

2. I send an agent ₱1297.80. After taking out his commission of 3%, how many Q of sugar can he buy at ₱7 a Q?

3. A dealer bought 400 books at ₱1.12½ each. Find the net amount if discounts of 20%, 10%, and 5% were given.

4. 340 cavanese of rice were sold for ₱1734, at a gain of 20%. Find the cost per cavan. Analyze.

5. Mr. Tirona pays a property tax of ₱42. If the rate of tax is $\frac{4}{5}\%$, what is the assessed value of his property?

6. A house was insured for $\frac{3}{4}$ of its value at $1\frac{1}{2}\%$. If the premium paid was ₱5.76, what was the value of the house?

7. A merchant bought 1000 m of satin at ₱1.25 a m. He paid 40% ad valorem duty, ₱.15 a meter specific duty, ₱30 for transportation, and ₱20 for insurance. For how much must he sell the satin a meter to gain 20% on the whole cost?

8. Find the interest on ₱475 for 2 yr. 3 mo. 18 da. at 8%.

9. What is the weight of a block of granite $1\frac{1}{2}$ m long, $\frac{3}{8}$ m wide, and $\frac{1}{2}$ m high, if the specific gravity of granite is 2.4?

10. At what rate will ₱480 yield ₱103.60 interest in 3 yr. 1 mo.?

1. In what time will ₱1200 yield ₱159 interest at 6%?

2. What principal will amount to ₱967.20 in 4 yr. 3 mo. 15 da. at 8%?

3. A note for ₱1460, dated June 24, 1907, payable in 4 months, is discounted at a bank Sept. 10, 1907, at 5% (exact interest). Find the term of discount and the proceeds.

4. A man sold a house for ₱3185, which was $87\frac{1}{2}\%$ of what he paid for it. Find the loss. Analyze.

5. What number increased by 55 % of itself equals 527?

6. If I gain $\frac{4}{5}$ of a centavo on each pencil sold at 8 centavos, what is my gain per cent?

7. An agent sold 4000 kilos of hemp at ₱.35 a kilo, and 3000 kilos of tobacco at ₱.45 a kilo. What was his commission at $2\frac{1}{4}\%$?

8. A building was insured for $\frac{3}{4}$ of its value at $\frac{7}{8}\%$. If the premium was ₱57.40, what was the value of the building?

9. An agent in Bacolod receives ₱9165.45 with which to buy sugar. After deducting $1\frac{1}{2}\%$ commission for buying, how many quintals can he buy at ₱7.20 per quintal?

10. I invested $\frac{1}{4}$ of my money in tobacco, $\frac{1}{2}$ of what remained in rice, and found that I had ₱366 left. How much money did I have at first?

1. Allowing 12 sq. m for doors and windows, find the cost, at ₱.35 per sq. m, of painting the four walls and ceiling of a room 5.5 m long, 4 m wide, and 3.5 m high.

2. If $\frac{3}{8}$ of the cost was gained by selling 25 carabaos for ₱3327.50, what was the average cost of the carabaos?

3. What per cent is gained if 44 cavanos of rice are bought for ₱198, and sold at ₱.22 $\frac{1}{2}$ per ganta?

4. Allowing 750 bricks to the cu. m, find the cost of the bricks, at ₱22 a thousand, in a wall 15 m long, 2.8 m high, and .4 m thick.

5. An agent sold horses at ₱120 a head on 6 % commission. If his commission was ₱403.20, how many horses did he sell?

6. One firm offers to sell me lumber worth ₱3200 with discounts of $12\frac{1}{2}\%$, 10 %, and 5 %. Another firm offers me the

same bill of lumber with a single discount of 25 %. Which is the better bargain and how much better is it ?

7. Find the simple interest on ₱ 1465 from Oct. 24, 1903, to June 30, 1907, at 9 %.

8. A can do a piece of work in 6 days, B can do it in 8 days, and C can do it in 12 days. How long will it take them to do the work all working together ?

9. In what time will ₱ 720 produce ₱ 158.40 simple interest at 8 % ? Analyze.

10. If a tank holds 7 tons of water, how many hektoliters of rice will it hold ?

1. What principal put at simple interest for 2 yr. 3 mo. 18 da. at 8 % will amount to ₱ 1036 ?

2. If it costs ₱ 2160 to fill in a street 360 m long and 16 m wide to a depth of $\frac{1}{4}$ m, what will it cost to fill in a street 240 m long and 18 m wide to a depth of $\frac{3}{8}$ m ?

3. What part of $4\frac{3}{8}$ is $2\frac{1}{2}$?

4. 2170 is $\frac{7}{12}$ of what number ?

5. A can do a piece of work in 6 days. A and B together can do it in 4 days. How long will it take B to do it alone ?

6. A man owning $\frac{3}{8}$ of a mill sold $\frac{2}{8}$ of his share. What part of the mill did he still own ? Analyze.

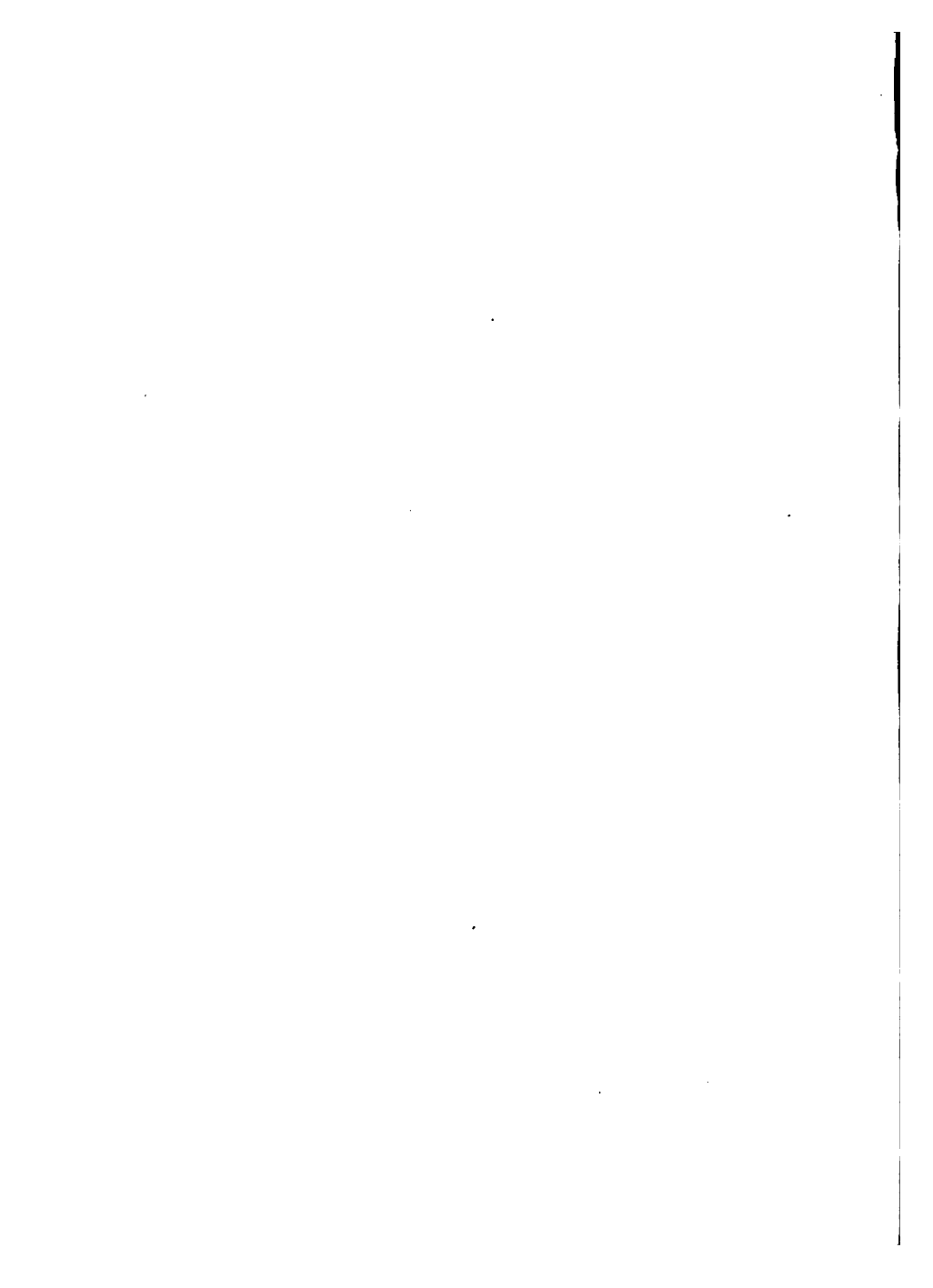
7. A man spent for tobacco ₱ 3636, which was $\frac{3}{8}$ of his money. At ₱ 30 a quintal, how many quintals of hemp can he buy with what he has left ?

8. Find the amount of ₱ 850 at 6 %, exact interest, from Sept. 10, 1907, to Feb. 3, 1908.

9. At what rate will ₱ 1600 yield ₱ 330 simple interest in 2 yr. 3 mo. 15 da. ?

10. In what time will ₱ 420 yield ₱ 158.76 interest at 12 % ?

PART III



PART III

Brief review introducing short methods; corporations; true discount; ratio and proportion; partnership; powers and roots; lines, surfaces, and volumes; use of the equation in the solution of problems.

SHORT METHODS

The following short processes are based on the fact that multiplications and divisions by 100 may be performed by moving the decimal point. They should be frequently reviewed, and used whenever it is possible in the solution of the problems in this book.

1. Oral.

To multiply by:

1. $50 \left(\frac{100}{2}\right)$, multiply by 100 and divide the product by 2.
2. $25 \left(\frac{100}{4}\right)$, multiply by 100 and divide the product by 4.
3. $33\frac{1}{3} \left(\frac{100}{3}\right)$, multiply by 100 and divide the product by 3.
4. $16\frac{2}{3} \left(\frac{100}{6}\right)$, multiply by 100 and divide the product by 6.
5. $14\frac{2}{7} \left(\frac{100}{7}\right)$, multiply by 100 and divide the product by 7.
6. $12\frac{1}{2} \left(\frac{100}{8}\right)$, multiply by 100 and divide the product by 8.

To divide by:

7. 50, multiply by 2 and divide the product by 100.
8. 25, multiply by 4 and divide the product by 100.
9. $33\frac{1}{3}$, multiply by 3 and divide the product by 100.
10. $16\frac{2}{3}$, multiply by 6 and divide the product by 100.
11. $14\frac{2}{7}$, multiply by 7 and divide the product by 100.
12. $12\frac{1}{2}$, multiply by 8 and divide the product by 100.

Give results at sight:

- | | | |
|---------------------------------|--------------------------------|-----------------------------|
| 13. $50 \times 64.$ | 23. $33\frac{1}{2} \times 75.$ | 33. $300 + 12\frac{1}{2}.$ |
| 14. $25 \times 88.$ | 24. $25 \times 120.$ | 34. $600 + 33\frac{1}{2}.$ |
| 15. $12\frac{1}{2} \times 72.$ | 25. $16\frac{2}{3} \times 96.$ | 35. $700 + 25.$ |
| 16. $33\frac{1}{3} \times 48.$ | 26. $2000 + 25.$ | 36. $1200 + 14\frac{2}{3}.$ |
| 17. $16\frac{2}{3} \times 120.$ | 27. $800 + 12\frac{1}{2}.$ | 37. $2500 + 33\frac{1}{2}.$ |
| 18. $14\frac{2}{3} \times 42.$ | 28. $1200 + 16\frac{2}{3}.$ | 38. $300 + 16\frac{2}{3}.$ |
| 19. $12\frac{1}{2} \times 136.$ | 29. $500 + 14\frac{2}{3}.$ | 39. $1200 + 12\frac{1}{2}.$ |
| 20. $33\frac{1}{3} \times 99.$ | 30. $2200 + 25.$ | 40. $4400 + 25.$ |
| 21. $16\frac{2}{3} \times 48.$ | 31. $3100 + 33\frac{1}{2}.$ | 41. $800 + 14\frac{2}{3}.$ |
| 22. $14\frac{2}{3} \times 49.$ | 32. $900 + 16\frac{2}{3}.$ | 42. $3100 + 16\frac{2}{3}.$ |

43. A farmer who owned 15 cows owned twenty-five times as many sheep. How many sheep did he own?

44. Juan earned ₱18 a week. How much did he earn in 50 weeks?

45. How many inches are there in $33\frac{1}{2}$ feet?

46. If Francisco walks 1 kilometer in 14 minutes, how long will it take him at that rate to walk $14\frac{2}{3}$ kilometers?

47. What will $16\frac{2}{3}$ dozen eggs cost at 36 centavos a dozen?

48. Mr. Santos deposited ₱ $12\frac{1}{2}$ a month in a savings bank. What was the amount of his deposit at the end of 16 months?

49. What will 25 pounds of sugar cost at 9 centavos a pound?

50. How many minutes are there in $16\frac{2}{3}$ hours?

51. If a man saves ₱25 a month, how long will it take him to save ₱2000?

52. At the rate of $33\frac{1}{3}$ Km an hour, how long will it take a train to run 200 Km?

53. A field containing 300 ars was divided into lots of $12\frac{1}{2}$ ars each. How many lots were there?

54. If $14\frac{1}{2}$ tons of coal cost ₱ 200, what is the price per ton?
55. How many days are there in $14\frac{1}{2}$ weeks?
56. What is the capacity of 32 jars holding $12\frac{1}{2}$ liters each?
57. How many skirts can be cut from 200 meters of sinamay, if each skirt requires $12\frac{1}{2}$ meters?
58. How many monthly payments of ₱ 25 each will be required to pay for a piano costing ₱ 450?
59. How many pieces $16\frac{2}{3}$ feet long can be cut from 1000 feet of rope?
60. What will $33\frac{1}{3}$ meters of linen cost at 48 centavos a meter?
61. How many cans holding $16\frac{2}{3}$ liters each can be filled from a tank containing 2000 liters of oil?
- The following is a convenient short method of squaring numbers of two places ending in 5:
- (1) Multiply the tens' figure by itself plus one.
 - (2) Square the units' figure, 5.
- $$35^2 = 1225 \quad (4 \times 3 = 12 \quad 5^2 = 25).$$
62. What is the square of 85? Of 95?
63. How many ars are there in a field 75 meters square?
64. What will 25 tables cost at ₱ 25 each?
65. At ₱ .45 each, what must I pay for 45 chickens?
66. At ₱ .20 a square meter, find the cost of the cloth necessary to cover the ceiling of a room 6.5 m square.
67. How many square centimeters are there in the entire surface of a cube 15 cm on each edge?
68. How many trees are there in an orchard containing 55 rows with 55 trees in each row?

REVIEW

2. Oral.

1. Express as per cents : $\frac{1}{4}$, $\frac{2}{5}$, $\frac{3}{4}$, $\frac{3}{5}$, $\frac{1}{6}$, $\frac{3}{8}$, $\frac{5}{8}$.
2. Express as common fractions : $12\frac{1}{2}\%$, 20% , 30% , 40% , 60% , $66\frac{2}{3}\%$, 80% , $87\frac{1}{2}\%$, 90% .
3. What is 25% of 1200? $16\frac{2}{3}\%$ of 360? $33\frac{1}{3}\%$ of 660?
4. 10 is 25% of what number? $12\frac{1}{2}\%$ of what number?
5. 22 is $33\frac{1}{3}\%$ of what number? $16\frac{2}{3}\%$ of what number?
6. 30 is 75% of what number? 60% of what number?
7. $62\frac{1}{2}\%$ of a number is 50. What is the number?
8. 120% of a number is 60. What is the number?
9. What number increased by $33\frac{1}{3}\%$ of itself equals 40?
10. What number decreased by 10% of itself equals 45?
11. 25 is what per cent of 75? 6 is what per cent of 36?
12. $12\frac{1}{2}\%$ is what per cent of 25? Of 75?
13. I sold a horse for ₦100, gaining 25% . Find the cost.
14. I sold a cow for ₦40, losing 20% . Find the cost.
15. What is 400% of ₦12? 175% of ₦40? $87\frac{1}{2}\%$ of ₦160? $37\frac{1}{2}\%$ of 40? 25% of 848? 65% of 65? 125% of 50?
16. What does an agent receive for buying ₦1240 worth of sugar, if his commission is 2% ?
17. At 25% ad valorem, the duty on a lot of bicycles was ₦310. What was the value of the bicycles? Analyze.
18. What is the difference between 22% of 200 and $16\frac{2}{3}\%$ of 180?
19. A house costing ₦2400 was sold for ₦3000. What was the gain per cent?
20. Find the net amount of a bill of goods listed at ₦660 and discounted $16\frac{2}{3}\%$.
21. $\frac{1}{2}$ of 60 is what per cent of 2 times 45?

22. Give the tax rate when the property value is ₦4400, tax ₦88. Property ₦8000, tax ₦40. Property ₦1000, tax ₦25.

23. What is the interest on ₦400 at 10 % for three years? For six months?

24. What is the amount of ₦500 at 8 % for 4 yr.? For $1\frac{1}{2}$ yr.?

25. What principal will yield ₦90 in three years at 10 %?

26. In what time will ₦600 yield ₦120 at 5 %?

27. At what rate will ₦200 yield ₦80 in four years?

28. A jeweler sold a clock for ₦42, thus gaining 20 %. What was the cost of the clock?

29. 25 % of 36 is what per cent of 45?

30. A house worth ₦6000 is insured for $\frac{3}{4}$ of its value at $1\frac{1}{4}$ %. What is the premium?

31. An agent received ₦66 for selling ₦2200 worth of tobacco. What was the rate of his commission?

32. What is the amount of ₦200 for 2 yr. 6 mo. at 6 %?

33. At ₦22.10 a thousand, what will be the annual premium on a life insurance policy of ₦8000?

34. What number increased by $37\frac{1}{2}$ % of itself equals 220?

35. A and B are business partners. A has ₦1200 invested in the business, B ₦800, and they gain ₦400. What is each man's share of the gain?

36. How many jars holding $12\frac{1}{2}$ liters each can be filled from a tank holding 35 hektoliters?

37. At the rate of $16\frac{2}{3}$ Km in 2 hours, how long will it take a man to walk 100 Km?

38. The difference in longitude between two places is $15^{\circ} 30'$. What is their difference in time?

39. A man owning $\frac{5}{8}$ of a farm sold $\frac{1}{2}$ of his share. What part of the farm does he still own?

3. Written.

1. Find 54 % of 1240. 35 % of 824. $66\frac{2}{3}$ % of 963.
2. 330 is 40 % of what number ?
3. 205 is 125 % of what number ?
4. What number decreased by $33\frac{1}{3}$ % of itself equals 1388 ?
5. 25 % of 1344 is what per cent of 4480 ?
6. 423.9 is what per cent of 942 ?
7. What number increased by 13 % of itself equals 71.981 ?
8. $\frac{3}{8}$ is what per cent of $\frac{8}{15}$?
9. Mr. Gonzales is six times as old as his grandson, and the difference in their ages is 65 years. How old is Mr. Gonzales ?
10. If I put 50 % of my money in one bank, 25 % in another, and 20 % in a third, and have ₱ 4200 besides, how much money have I all together ?
11. A man invested ₱ 43,750 in real estate. If this was $62\frac{1}{2}$ % of his money, how much had he left ?
12. By selling rice at a gain of 9 %, a speculator received ₱ 27,904. What did the rice cost him ?
13. The average daily attendance for one year in a certain school was 420, and for the following year 560. What was the per cent of increase ?
14. A merchant bought $\frac{4}{5}$ of a hektoliter of vinegar for ₱ .09 a liter. He sold $\frac{3}{5}$ of it at ₱ .12 a liter and the remainder at ₱ .13 a liter. How much did he gain ?
15. Allowing 25 sq. m for openings, what will it cost at ₱ .35 per square meter to paint the outside walls of a house 8.5 m long, 6.5 m wide, and 5.2 m to the eaves ?
16. The product of two numbers is $2\frac{2}{11}$; one of the numbers is $\frac{1}{5}$. What is the other number ?
17. $\frac{8}{9}$ is 20 % less than what number ?

18. What will it cost to build a wall 36 m long, 2.4 m high, and .6 m thick, of hollow concrete blocks 60 cm by 30 cm by 20 cm, at ₱.90 each?
19. At ₱.30 per square meter, what will it cost to build a gravel road 2.2 Km long and 5 m wide?
20. Find the cost of 25 boards, each 15 ft. long, 11 in. wide, and 1 in. thick, at ₱.12 a bd. ft.
21. Find the number of board feet in the following bill of lumber: 20 joists, 10 in. by 2 in., 15.8 ft. long; 30 boards, 11 in. by $1\frac{3}{4}$ in., 15.2 ft. long; and 48 boards, 15 in. by $1\frac{1}{2}$ in., 12 ft. long.
22. Find the cost of a pile of stone 3.5 m long, 1.2 m wide, and 1.5 m high, at ₱2.25 per cubic meter.
23. If the specific gravity of brick is 2.1, what will be the weight of the brick in a load 1.2 m long, .8 m wide, and .5 m high?
24. How many tiles 25 cm square will it take to lay a floor 8.5 m long and 6.25 m wide?
25. A certain reservoir has an inlet pipe that will fill it in 5 hours, and two outlet pipes, one of which will empty it in 12 hours and the other in 15 hours. If all three pipes are opened at the same time, how long will it take to fill the reservoir?
26. A boy paid ₱4.90 for a hat. If this was $22\frac{1}{2}\%$ more than he paid for a pair of shoes, what did he pay for both?
27. I sold 45 quintals of hemp for ₱2588.90, which was at a gain of $8\frac{1}{2}\%$. What did the hemp cost per quintal?
28. Two successive discounts of 20% and 10% reduced a bill to ₱144. What was the original bill?
29. I sent an agent ₱365.40. After taking out his commission of 5% for buying, how many piculs of hemp did he buy at ₱14.50 per picul?

4. Written.

1. A piano was sold for ₱464, which was 16 % more than it cost. What was the gain?
2. A farmer sold cacao and coffee for ₱486. If he received 43 % more for the cacao than for the coffee, how much did he receive for each?
3. What is gained when 3 dozen oranges, bought at ₱.02 each, are sold at $33\frac{1}{8}$ % advance?
4. At what price must a merchant mark an article costing ₱8 so that he may give a discount of 20 % and still have a profit of 25 %?
5. What principal will amount to ₱1483.88 in 3 yr. 24 da. at $7\frac{1}{2}$ %?
6. A dealer bought cigars at ₱5 a hundred and sold them 4 for ₱.25. What was his gain per cent?
7. A traveler has gone 1220 Km of a journey, which is $\frac{2}{5}$ of the distance he has yet to go. How long is his journey?
8. Divide 2002 hundred-thousandths by 2 thousandths, and write the result in words.
9. The value of the English pound sterling in U. S. money is \$4.8665. How many pounds can you get for \$24,332.50?
10. How much waste will there be after cutting as many 2-cm cubes as possible from a 5-cm cube?
11. How many square centimeters are there in the surface of a block of granite .75 m by .58 m by .3 m? Find the length of its edges in decimeters.
12. One half of my goods was destroyed by fire, one half of the remainder was destroyed by water, and the part left was damaged to such an extent that it sold for 60 % of its original value. If the sales amounted to ₱1536, what was the original value of my stock?

13. What is the difference between a single discount of 40 % and two successive discounts of 20 % and 20 % from a bill of ₱500?

14. A boy lost $12\frac{1}{2}$ % of his marbles and had 112 marbles left. How many had he at first? Analyze.

15. Find the simple interest on ₱625 for 3 yr. 4 mo. 15 da. at 8 %.

16. If lead is 11.4 times as heavy as water, and iron 68 % as heavy as lead, what is the weight of 100 cu. cm of iron?

17. A merchant sold a suit of clothes for ₱36 and gained $12\frac{1}{2}$ %. How much would he have gained if he had sold it for ₱38.40?

18. A man sold two horses for ₱240 each. He gained 20 % on one and lost 20 % on the other. Did he gain or lose by the two sales, and how much?

19. If ₱60 is paid for insuring a house worth ₱3600 for $\frac{2}{3}$ of its value, what is the rate of insurance? Analyze.

20. After deducting 25 % and 15 % from the marked price, goods were sold for ₱280.50. What was the marked price?

21. An agent received ₱126 for buying tobacco at $3\frac{1}{2}$ % commission. How many bales did he buy at ₱12.50 per bale?

22. What is the rate of taxation when I pay a tax of ₱35.50 upon property assessed at ₱5680?

23. In what time will ₱660 yield ₱178.20 interest at 8 %?

24. What principal will amount to ₱858.75 in 2 yr. 5 mo. at 6 %? Analyze.

25. Find the compound interest on ₱1250 for 1 yr. 6 mo. at 8 %, payable semi-annually.

26. What per cent do I gain by buying lead pencils at ₱2.80 per hundred and selling them at ₱.42 per dozen?

CORPORATIONS

5. Oral.

A number of persons associated together for the purpose of transacting business form what is called a **stock company**, or **corporation**.

The **capital** is the money supplied by the members of the corporation to carry on the business. It is divided into **shares of stock**, usually of ₱100 each.

Each person who owns one or more shares is a **stockholder**.

Each stockholder receives a **certificate of stock** which shows the number of shares he owns and their value. This value is called their **par value**.

Stocks are **above par**, or at a **premium**, when they sell for more than their par, or face, value; and are **below par**, or at a **discount**, when they sell for less than their face value.

The **market value** of shares of stock is the price at which they are sold.

A person who buys and sells stocks for others is called a **stockbroker**, and his commission is called **brokerage**. The brokerage is a certain per cent of the par value of the stock bought or sold.

The stockholders elect a few of their number to have general direction of the company. These men are called **directors**.

The profits of the company, after all expenses are paid, are divided among the stockholders. These earnings are called **dividends**. The directors decide on the rate of dividend.

If a corporation with a capital stock of ₱200,000 earns ₱9000 beyond all expenses, it may declare a $4\frac{1}{2}\%$ dividend. Each stockholder then receives $4\frac{1}{2}\%$ of the par value of his shares of stock. A man owning 20 shares receives ₱90; 100 shares, ₱450, etc.

In the following problems ₱100 is considered one share.

6. Written:

1. How many shares of stock are there in a company with ₦750,000 capital?

2. A company with ₦1,000,000 capital declares a $5\frac{1}{2}\%$ dividend. How much does the holder of 120 shares receive?

3. A railway company with ₦800,000 capital divides ₦32,000 in dividends. What does the holder of 45 shares receive?

4. How much does the holder of 25 shares of stock in a certain steamship line receive when a dividend of $3\frac{1}{2}\%$ is declared?

5. A certain electric light and power company declares a $1\frac{1}{2}\%$ dividend quarterly. What is the annual income of a man who owns 40 shares?

6. What is the rate of semi-annual dividends when a stockholder receives ₦70 every six months on his 30 shares of stock?

7. How many shares of stock must a man own to receive ₦500 each year when $1\frac{1}{4}\%$ quarterly dividends are paid by the company?

8. What is the market value of 50 shares of mining stock at 8% premium?

9. What is the value of 35 shares of street railway stock at 10% discount?

10. What is the value of 18 shares of stock at 7% above par?

11. What is the value of 75 shares of stock at $12\frac{1}{2}\%$ discount?

12. If I buy stock at 2% discount and sell it at 5% premium, what is my gain per cent? Analyze.

13. If I buy stock at 10% premium and sell it at 3% premium, what do I lose on 80 shares?

14. How many shares of railroad stock at 6% discount can be purchased for ₦5264? Analyze.

15. Find the annual income from ₱7560 invested in stock at 105, paying 8%.

$\text{₱}7560 \div \text{₱}105$ (cost of one share) = 72, number of shares. $72 \times \text{₱}100 = \text{₱}7200$, par value. 8% of ₱7200 = ₱576, income.

16. What do I receive from 20 shares of stock sold at 108, brokerage $\frac{1}{4}\%$?

17. How much is gained on 50 shares of bank stock purchased at 95 and sold at 102?

18. Mr. Soler invested ₱3760 in stock at 6% discount. How many shares did he purchase?

19. I purchased 40 shares at 98 and sold them at 104, paying $\frac{1}{8}\%$ brokerage for each transaction. Find the gain.

20. How much, including brokerage at $\frac{1}{4}\%$, must be paid for 60 shares of Manila street railway stock at 101?

One share costs ₱101 + ₱.25, or ₱101.25.

21. What was paid for 120 shares of railway stock at $12\frac{1}{2}\%$ below par, brokerage $\frac{1}{4}\%$?

22. What per cent do I receive on my investment, if I buy stock at 80 which pays 6%?

23. A bank whose capital is ₱200,000 pays a 4% dividend. How much is paid to Mr. Capiz, who owns 20 shares of stock?

24. What per cent on the investment is gained by buying stock at 15% discount, if the stock pays an annual dividend of 5%?

25. Mr. Rizal bought 140 shares of stock in an electric plant at $3\frac{1}{2}\%$ discount and sold them at par value. What did he gain?

26. A semi-annual dividend of $4\frac{1}{2}\%$ was declared on some railway stock of which I owned 85 shares. What was my annual profit?

27. If 6% stock is bought at 25% discount, what is the rate of income on the investment?

28. A man receives a semi-annual dividend of 3% on bank stock which he bought at 120. What rate of interest does he receive on his money?

29. A man has 40 shares of railroad stock on which he receives quarterly dividends of $1\frac{3}{4}\%$. If he bought the stock at 90, what rate of interest does he receive on his investment?

30. An annual dividend of 4% on my bank stock yields me an income of ₱3200. What is my stock worth at ₱130 a share?

31. A man gained ₱160 by selling 40 shares of stock at $127\frac{1}{8}$. At what price did he buy it?

32. A man bought 80 shares of mining stock at $87\frac{1}{2}$ and 50 shares of railroad stock at 112, brokerage $\frac{1}{4}\%$. Find the cost.

33. What must I pay for stock that yields a dividend of 6% in order to realize 8% on the investment?

34. How many shares of Manila street railway stock at 104 will purchase 240 shares of bank stock at 91?

35. A farmer sold $\frac{3}{4}$ of his farm of 520 hektars at ₱77 per hektar and invested the proceeds in bank stock at 91. How many shares did he purchase?

36. A broker sold for me 160 shares of stock at $106\frac{1}{2}$. If he retained $\frac{1}{8}\%$ brokerage, how much did he pay over to me?

37. What per cent is received on an investment in stock at $87\frac{1}{2}$ that pays a dividend of $7\frac{1}{2}\%$?

38. How many shares at 10% premium can I buy for ₱9481.50 if the brokerage is $\frac{1}{4}\%$? What income have I from these shares if they pay an annual dividend of $5\frac{1}{2}\%$?

39. Which is the better investment, 6% stock at 125 or 5% stock at par?

40. A man bought 220 shares of stock at 112. He paid for it, including brokerage, ₱24,695. What rate of brokerage did he pay?

TRUE DISCOUNT

7. Written.

The **present worth** of a debt payable at a future time without interest is a sum which will amount to the debt if put at interest until that time.

The **true discount** is the difference between the face of the debt and its present worth.

Find the present worth and true discount of a debt of ₱ 604.80, due in 1 yr. 4 mo. without interest, when money is worth 6 %.

₱ 1.08 is the amount of ₱ 1 for 1 yr. 4 mo. at 6 %, that is, ₱ 1 is the present worth of ₱ 1.08.

$$\text{₱ } 604.80 \div \text{₱ } 1.08 = \text{₱ } 560.$$

Therefore, ₱ 560 is the present worth of ₱ 604.80.

$$\text{₱ } 604.80 - \text{₱ } 560 = \text{₱ } 44.80, \text{ the true discount.}$$

To find the present worth, divide the debt by the amount of ₱ 1 for the given time, at the given rate.

To find the true discount, subtract the present worth from the debt.

1. Find the present worth of ₱ 726.29 due in 3 yr. at 6 %.
2. What is the present worth of ₱ 1112.50 due in 2 yr. 3 mo. if money is worth 5 % ?
3. Find the present worth and true discount of a debt of ₱ 371 due in 8 mo., without interest, when money is worth 9 %.
4. Find the true discount on ₱ 302.40 due in one year at 5 %.
5. Which would be more profitable, and how much, to pay ₱ 5000 cash for a farm, or ₱ 5341 in 1 yr. 6 mo., money being worth 6 % ?
6. If money is worth 8 %, what cash offer will be equivalent to an offer of ₱ 312 for a bill of goods on 6 mo. credit ?
7. Which is the greater and how much, the interest or the true discount on ₱ 900 due in 1 yr. 6 mo., if money is worth 10 % ?

8. Which is better, to pay ₱11.20 per 100 lb. for sugar, or ₱11.44 on 8 months' time, money being worth 6%?

9. Find the difference between the interest and the true discount on ₱8344, due in 3 yr., if money is worth 4%.

10. Find the bank discount on a note for ₱730 due in 60 da., without interest, discounted at 8%.

Bank discount is exact interest, counting 365 da. as a year, upon the amount of a note at its maturity.

11. Find the difference between the bank discount and the true discount on a note for ₱1095 due in 90 days, without interest, the discount in each case being 8%.

12. What is the true discount on ₱1000 due in 2 yr. 6 mo., without interest, when money is worth 8%?

13. Find the present worth of a debt of ₱1800 due in 2 yr. 6 mo., without interest, when money is worth 5%.

8. Written.

Find the bank discount and proceeds of the following notes :

FACE	DATE OF NOTE	TIME	DATE OF DISCOUNT	RATE OF DISCOUNT
1. ₱500 . .	June 17 .	60 da. .	July 18 .	6 %
2. ₱2000 . .	Jan. 2 .	4 mo. .	April 2 .	4½ %
3. ₱2500 . .	Aug. 3 .	2 mo. .	Sept. 15 .	6 %
4. ₱3600 . .	May 18 .	60 da. .	June 5 .	5 %

Find the present worth and true discount of the following, without interest :

DEBT	DUE IN	MONEY WORTH
5. ₱374.40	6 mo.	8 %
6. ₱504	1 yr. 4 mo.	9 %
7. ₱1562.50	2 yr. 6 mo.	10 %
8. ₱1000	1 yr. 9 mo.	8 %
9. ₱750	60 da.	12 %

RATIO AND PROPORTION

RATIO

9. Oral.

1. Mariano has 15 centavos and Paula has 5 centavos. How does Mariano's money compare with Paula's? How does Paula's compare with Mariano's?

2. How does ₱20 compare with ₱40? ₱50 with ₱10?

3. 3 bears what relation to 12?

4. 12 bears what relation to 3?

5. What is the relation of 5 to 25? Of 28 to 4? Of 7 days to 28 days? Of 30 tons to 3 tons?

Ratio is the relation of one number to another of the same kind. It is found by dividing the first number by the second.

The ratio of 2 meters to 8 meters is $\frac{1}{4}$.

The **terms** of a ratio are the two numbers compared.

The first term of a ratio is the **antecedent** and the second is the **consequent**.

The sign of a ratio is ($:$). $6:18 = \frac{1}{3}$ is read, "the ratio of 6 to 18 is $\frac{1}{3}$." 6 is the antecedent, 18 is the consequent, and $\frac{1}{3}$ is the ratio.

If the antecedent and consequent be interchanged, the resulting ratio is the **inverse** of the given ratio. $6:18$, when written inversely, becomes $18:6$. The value of the first ratio, $\frac{1}{3}$, when inverted, becomes the value of the second ratio, 3.

$5:4$ and $\frac{5}{4}$ are the two common ways of expressing a ratio.

State the values of the following ratios:

- | | | | |
|------------|--------------------------------|---|--|
| 6. $3:21$ | 10. $\frac{1}{6}:\frac{2}{7}$ | 14. $100\text{ m}:12\frac{1}{2}\text{ m}$ | 18. $108^\circ:9^\circ$ |
| 7. $35:5$ | 11. $90:45$ | 15. $\$25:\10 | 19. $100\text{ g}:8\frac{1}{2}\text{ g}$ |
| 8. $100:2$ | 12. $\frac{2}{3}:\frac{1}{5}$ | 16. $130:260$ | 20. $50\text{ hr.}:250\text{ hr.}$ |
| 9. $15:60$ | 13. $\frac{7}{15}:\frac{5}{8}$ | 17. $8\text{ da.}:72\text{ da.}$ | 21. $11\text{ da.}:132\text{ da.}$ |

$\frac{1}{3} = 7$ This means, what number divided by 3 = 7? The answer is 21, since $21 \div 3 = 7$.

$\frac{24}{7} = 8$ The answer is 3, since $24 \div 3 = 8$.

$\frac{7}{7} = 12$ The answer is 84, since $84 \div 7 = 12$.

State the value of the unknown term in each of the following ratios:

22. $\frac{?}{6} = 6$

23. $\frac{?}{9} = 12$

24. $\frac{?}{15} = 3$

25. $\frac{?}{120} = \frac{1}{2}$

26. $\frac{?}{25} = 3$

27. $\frac{?}{15} = \frac{1}{3}$

28. $? : 13 = 3$

29. $? : 8 = \frac{1}{4}$

30. $? : 30 = \frac{1}{10}$

31. $\frac{25}{?} = 5$

32. $\frac{120}{?} = 3$

33. $\frac{9}{?} = \frac{1}{2}$

34. $\frac{75}{?} = 3$

35. $\frac{16}{?} = \frac{1}{2}$

36. $\frac{6}{?} = \frac{2}{3}$

37. $11 : ? = \frac{1}{3}$

38. $80 : ? = 2$

39. $150 : ? = \frac{1}{2}$

40. $? : 12 = 5$

41. $55 : ? = 5$

42. $88 : ? = 11$

43. $? : 99 = \frac{1}{3}$

44. $? : 54 = \frac{1}{6}$

45. $? : 2 = 18$

46. $95 : ? = 5$

47. $160 : ? = 10$

48. $? : 4 = 100$

10. Written.

Separate ₹ 2540 into parts having the ratio of 7 to 13.

Since $7 + 13 = 20$, out of every ₹ 20, ₹ 7 will belong to the first part and ₹ 13 to the second. Therefore $\frac{7}{20}$ of ₹ 2540, or ₹ 889, will be the first part and $\frac{13}{20}$ of ₹ 2540, or ₹ 1651, will be the second part.

To check the result: ₹ 889 + ₹ 1651 = ₹ 2540.

1. Separate 120 into two parts having the ratio of 3 to 5.
2. Separate 360 into two parts having the ratio of 4 to 5.
3. Separate ₹ 4927 into two parts having the ratio of 2 to 11.
4. A 3-meter bamboo pole is cut into two parts which have the ratio of 1 to 4. Give the length of each part in decimeters.
5. A and B are business partners. A invests ₹ 6000 in the business, and B ₹ 4000. They gain ₹ 2400. If they divide the gain in the ratio of the amounts invested, what is the share of each?

6. Two fishermen agreed to pay the rent of a boat, dividing the payment according to the number of days the boat was used by each. One used it 25 days and the other 30, and they paid ₦14.30. What was the share of each?

7. In a class of 35 pupils, 6 out of 7 were promoted. What was the ratio of the promoted to the non-promoted? How many failed of promotion?

8. For every 2 kilos of silk in a certain kind of cloth there are 5 kilos of abaca. How many kilos of each material are there in 14 rolls of the cloth weighing $3\frac{1}{2}$ kilos per roll?

SIMPLE PROPORTION

11. Written.

A **simple proportion** is an expression of the equality of two ratios.

The ratio of 12 to 6 is 2. The ratio of 100 to 50 is 2. Therefore, the ratio of 12 to 6 equals the ratio of 100 to 50.

This proportion is written, $12 : 6 = 100 : 50$, or $\frac{12}{6} = \frac{100}{50}$.

The first and fourth terms of a proportion are the **extremes**; the second and third are the **means**.

Have the pupils write a number of proportions and name the means and extremes in each, in order to test their understanding of the terms defined above. To test the equality of the ratios forming a proportion, the ratios may be expressed in fractional form and their values compared.

When four numbers are in proportion, the product of the extremes equals the product of the means.

Let the pupils test this equality with the proportions they have written and proved.

Either extreme is equal to the product of the means divided by the other extreme; and either mean is equal to the product of the extremes divided by the other mean. Hence, if any three terms of a proportion are given, the fourth may be found.

The following examples illustrate the principles stated above:

$$\begin{array}{rcl}
 2 : 11 = 10 : ? & 16 : 4 = ? : 12 & ? : 10 = 65 : 13 \\
 \begin{array}{c} 5 \\ 11 \times \cancel{10} \\ \hline 2 \end{array} = 55 & \begin{array}{c} 3 \\ 16 \times \cancel{12} \\ \hline 4 \end{array} = 48 & \begin{array}{c} 5 \\ 10 \times \cancel{65} \\ \hline \cancel{13} \end{array} = 50
 \end{array}$$

Find the missing term in each of the following:

1. $8 : 12 = 20 : ?$ 7. $18 : ? = 30 : 125$ 13. $40 : 6 = ? : 18$
2. $9 : 2 = ? : 8$ 8. $? : 12 = 5 : 30$ 14. $65 : 50 = 39 : ?$
3. $5 : 40 = 12 : ?$ 9. $33 : 9 = 22 : ?$ 15. $180 : ? = 28 : 49$
4. $32 : 6 = ? : 18$ 10. $5 : 80 = ? : 64$ 16. $? : 84 = 7 : 196$
5. $? : 5 = 100 : 25$ 11. $? : 16 = 18 : 24$ 17. $2 : ? = 3 : 96$
6. $19 : ? = 3 : 9$ 12. $11 : ? = 5 : 75$ 18. $58 : 8 = 87 : ?$

12. Written.

If 7 camisas can be made from 28 meters of jusi, how many camisas can be made from 64 meters?

It is customary to arrange the numbers so that the number required for the answer may be the fourth term. Only like numbers can form a ratio.

Since the number of camisas is required, 7 is the third term. The arrangement of the numbers forming the first ratio depends on whether the fourth term is to be larger or smaller than the third. Since 64 meters will make a greater number of camisas than 28 meters, 64 is the second term and 28 the first term.

The proportion is $28 : 64 = 7 : ?$.

Dividing the product of the means by the given extreme,

$$\frac{\begin{array}{c} 16 \\ \cancel{64} \times 7 \end{array}}{\begin{array}{c} 28 \\ \cancel{4} \end{array}} = 16, \text{ therefore 16 camisas can be made.}$$

1. If 10 goats cost ₱30, what will 32 goats cost?
2. If a man rides 64 kilometers in 4 days, how far can he ride in 15 days at the same rate?
3. If a woman weaves 14 meters of sinamay in 5 days, how long will it take her to weave 56 meters?
4. If 250 kilos of tobacco cost ₱861, what will 135 kilos cost at the same rate?
5. If I pay ₱1386 for 84 piculs of hemp, how many piculs can I buy for ₱330?
6. If 4 men can do a piece of work in 9 days, how long will it take 6 men to do it?

If 4 men can do it in 9 days, 6 men can do it in less time. The number of days required will diminish in the same ratio that the number of men increases. The number of men is proportional inversely to the number of days.

7. If a certain amount of zacate will feed 14 horses 39 days, how long will it feed 13 horses?
8. How many men will be required to do in 20 hours the work that 16 men can do in 30 hours?
9. How high is a tree that casts a shadow $5\frac{1}{2}$ m long, when a pole $12\frac{1}{2}$ m long casts a shadow $1\frac{1}{4}$ m long?
10. How far can a train run in 5 hours, if it runs 195 Km in $6\frac{1}{2}$ hours?
11. At the rate of 14 turkeys for ₱87.50, how much must I pay for 5 turkeys? For 24 turkeys?
12. If 28 horses cost ₱3780, what will be the cost of 39 horses? Of 17 horses?
13. At the rate of $7\frac{1}{4}$ m for ₱10.15, how many meters of silk can I purchase for ₱16.80?
14. If 6 men can do a piece of work in 12 days, how long will it take 10 men to do it?

15. If the interest on ₦4200 for a certain time is ₦252, what will be the interest on ₦800 for the same time, at the same rate?

16. Find the cost of $4\frac{2}{3}$ tons of coal if $\frac{1}{3}$ of a ton costs ₦8.75.

17. Forty men can do a piece of work in 90 days. After 20 days, 15 of them refuse to work. In how many days can the rest complete the work?

18. If a certain amount of food will last 200 soldiers 50 days, how long will it last if 50 soldiers are added to the original number at the end of 20 days?

19. If ₦5000 yields ₦750 interest in $2\frac{1}{2}$ years, in what time will the same principal yield ₦1100 interest?

20. If a class of 32 pupils can be supplied with arithmetics at a cost of ₦14.72, what will it cost to supply 26 pupils?

21. What will $47\frac{1}{4}$ kilos of sugar cost at the rate of $4\frac{1}{2}$ kilos for ₦1?

22. If 560 barrels of cement weigh 70 tons, what will be the weight of 345 barrels?

23. If .6 of a hektar of land is worth ₦75, what is .45 of a hektar worth?

24. A owns $\frac{3}{8}$ of an estate and B $\frac{1}{8}$. If A's share is worth ₦45,000, what is the value of B's share?

25. If a block of stone 1.5 m long, 50 cm wide, and 22 cm thick weighs $293\frac{1}{8}$ Kg, what will be the volume of a block of the same kind of stone that weighs 1 ton?

26. If a piece of iron 10 cm long, 4 cm wide, and 2.5 cm thick weighs 750 grams, what is the volume of a piece of iron that weighs 980 grams?

27. If a lot 50 m by 40 m can be bought for ₦1240, how many square meters can be bought for ₦775?

PARTNERSHIP

13. Oral.

Partnership is an association of two or more persons for the transaction of business.

If the partners invest their capital for equal periods of time, the division of profits or losses is made proportionally to the amounts invested.

If the partners invest their capital for unequal periods of time, the division of profits or losses is made proportionally to the several amounts invested and the periods of investment.

José and Pedro share ₱ 25 in the ratio of 2 to 3. How much has each?

Out of every ₱ 5, José will have ₱ 2 and Pedro ₱ 3. Therefore, José will have $\frac{2}{5}$ and Pedro $\frac{3}{5}$ of the sum to be divided. José's share will be ₱ 10 and Pedro's ₱ 15.

1. Divide 21 centavos into two parts that shall be to each other as 4 is to 3.

2. Divide ₱ 35 between two men in the ratio of 2 to 5.

3. Divide 90 into three parts that shall be to each other as 2, 3, and 4.

4. I divided ₱ 2.40 between two boys, giving 3 centavos to the first as often as I gave 5 centavos to the second. How much did each boy receive?

14. Written.

A and B entered into partnership. A furnished ₱ 1000 for 2 years and B ₱ 3000 for 1 year. Their profits amounted to ₱ 1800. What was the share of each?

The use of ₱ 1000 for 2 years is equal to the use of ₱ 2000 for 1 year, hence the profits must be divided in the ratio of ₱ 2000 to ₱ 3000, that is, 2 : 3.

A received $\frac{2}{5}$ of ₱ 1800, or ₱ 720; B, $\frac{3}{5}$ of ₱ 1800, or ₱ 1080.

1. A and B engaged in trade for one year. A invested ₦5000 and B ₦6000. They gained ₦2200. What was the share of each?

2. A, B, and C entered into partnership with a joint capital of ₦60,000. A furnished ₦12,000, B ₦28,000, and C the remainder. If their profits were ₦8400, what was each partner's share?

3. A and B formed a partnership. A put in ₦6000 for 2 yr. and B ₦6000 for 3 yr. They gained ₦5040. Find the share of each.

4. Three men formed a partnership. A invested ₦3500, B ₦2500, and C ₦1500. They gained ₦1500. What was each partner's share of the gain?

5. A, B, and C form a partnership. A puts in ₦2000 for 3 yr., B ₦4000 for 2 yr., and C ₦3000 for 2 yr. The total gain is ₦6400. What is each partner's share?

6. Three men engaged in business together. A put in ₦2800, B ₦3500, and C ₦4200. They lost ₦1575 the first year. What was each partner's share of the loss?

7. A and B entered into partnership for one year. A furnished ₦5000 and B ₦8000. At the end of six months A put in ₦2000 more and B drew out ₦4000. Their net gain was ₦3600. What was each partner's share?

8. A and B entered into partnership for one year. A furnished ₦10,000 and B ₦8000. At the end of 3 months A added ₦2000 to his capital, and at the end of 8 months B added ₦4000 to his. What was the share of each, if the entire gain was ₦3750?

9. A, B, and C formed a partnership. A put in ₦7000 for 1 year, B ₦1000 for 6 months, and C ₦3000 for 6 months. They lost ₦1080. Find each man's share of the loss.

REVIEW

15. Oral.

1. What is the cost of 64 hats at ₱.25 each?
2. What is the value of 60 pounds of sugar, if 80 pounds cost ₱ 16?
3. A merchant by selling goods for ₱ 180 lost 10 %. What did the goods cost?
4. How many meters of fence are required to fence a square lot containing one ar?
5. A lot containing 400 sq. m is four times as long as it is wide. How many meters of fence are required to inclose it?
6. If three girls together earn ₱.90 per day weaving jusi, what will 10 girls earn in 4 days at the same rate?
7. At ₱ 1.25 per 100 Kg, what will it cost to haul 1200 Kg of hemp a distance of 22 miles?
8. If 1000 coconuts yield 200 Kg of copra, how much copra can be obtained from 1400 nuts?
9. If I pay ₱ 1000 for 1500 Hl of salt, what is the cost of 30 liters?
10. At ₱ .33 $\frac{1}{3}$ each, how many chickens can I buy for ₱ 42?
11. If a boy can ride a bicycle at the rate of 12 Km in 48 minutes, how long will it take him to ride 500 meters at the same rate?
12. Two men received ₱ 60 for painting a house. One worked for ₱ 2 a day and the other for ₱ 3 a day. How much should each receive?
13. A house worth ₱ 1800 was insured for $\frac{2}{3}$ of its value at $\frac{3}{4}$ %. What was the premium?

14. What is received for a ₱1200 piano if it is sold at a discount of 40 %?

15. A man gave his daughter ₱45, which was equal to $\frac{2}{5}$ of the sum he gave his son. How much did he give his son?

16. There are three times as many girls in a school as there are boys. If the whole number is 240, how many of each are there?

17. How many 3-cm cubes are there in a stick of timber 24 cm by 6 cm by 3 cm?

18. The difference between $\frac{1}{2}$ of a number and $\frac{1}{3}$ of the same number is 12. What is the number?

19. How many 2-cm squares are there in a sheet of paper 2 m long and .8 m wide?

20. When it is 11 o'clock a.m. at one place, what time is it at a place 45° east of that place?

21. In what time will ₱400 yield ₱50 interest at 5 %?

22. 63 is $\frac{1}{3}$ less than what number?

23. What is the weight of 1 cu. dm of gold (sp. gr. 19.25)?

24. Express in cubic centimeters the volume of 28.8 Kg of zinc (sp. gr. 7.2).

25. If 1.25 m of jusi cost ₱1, what is the cost per meter?

26. A horse cost ₱320, and $\frac{3}{4}$ of its cost was 3 times the cost of a cow. What was the cost of the cow?

27. A grocer bought 140 lb. of coffee, 25 % of which was green coffee worth ₱.35 per lb. Find the value of the green coffee.

28. The difference in time between two places is 4 hr. 3 min. What is their difference in longitude?

29. What must I pay for 65 knives at ₱.65 each?

30. If cork weighs 15 lb. per cubic foot, what is the weight of a piece of cork $\frac{1}{2}$ ft. by $\frac{1}{2}$ ft. by $\frac{1}{2}$ ft.?

31. If 5 men can do a piece of work in 6 days, how long will it take 3 men to do it? Analyze.

32. I sell 8 mangos for 96 centavos and gain 16 centavos. What was the cost of each mango? Analyze.

33. A man and his son together earned ₱40. If the man earned ₱4 while the son earned ₱1, what was the share of each?

34. If a boy earns ₱2.25 a week, how much will he earn in 8 weeks?

35. At 120, how many shares of stock can I buy for ₱3600?

36. $? : 88 = \frac{1}{4}$. $? : 120 = \frac{1}{5}$. $31 : ? = \frac{1}{3}$. $104 : ? = 2$.

37. Separate 180 into two parts having the ratio of 4 to 5.

38. A invests ₱3000 in business with B, who invests ₱5000. If they gain ₱1600, what is each man's share of the gain?

39. $3 : 5 = ? : 15$. $4 : ? = 3 : 9$. $₱7 : ₱21 = 11 : ?$ $? : 5 = 6 : 15$.

40. If a boy can walk 28 Km in 7 hours, in how many hours can he walk 84 Km? Analyze.

41. Divide 200 into three parts that shall be to each other as 2, 3, and 5.

42. I divided ₱2.40 between two boys, giving 5 centavos to the first as often as I gave 7 centavos to the second. How much did I give to each?

43. What rate of interest do I receive on my investment by buying 6 % stock at 120? Analyze.

44. What will 16 shares of railroad stock cost at $112\frac{1}{2}$?

45. What did I pay for 5 % shares of stock, if the interest on my investment is 4 %? Analyze.

46. What is the income from $32\frac{5}{8}$ % 100-peso shares?

16. Written.

1. What will 2.4 tons of hemp cost at ₱ 22.50 per 100 kilos?
2. If there are 34,200 farms in Leyte averaging 362 ars each, and $30\frac{1}{2}\%$ of this farm land is cultivated, how many hektars are under cultivation?
3. If 1 Kg of jusi fiber makes 48 m of cloth, and the fiber costs ₱ 22 per kilo, what will be the cost of the fiber used in making 6 rolls of cloth of 25 m each?
4. After paying $\frac{1}{5}$ of a debt, and then $\frac{1}{3}$ of the remainder, I owe ₱ 588 less than at first. How much was the debt?
5. In what time will a sum of money double itself at $4\frac{1}{2}\%$? At 5% ? At $7\frac{1}{2}\%$?
6. July 1, A and B formed a partnership for one year, each furnishing ₱ 8000 capital. Sept. 1, A added ₱ 4000 and Nov. 1, he added ₱ 3000 more. Oct. 1, B added ₱ 2000 and March 1, he withdrew ₱ 1000. What share of the profits should each receive at the end of the year, if they gained ₱ 1620?
7. A house was insured for $\frac{3}{4}$ of its value at $1\frac{1}{4}\%$. The premium paid was ₱ 157.50. What was the value of the house?
8. A can do a piece of work in $4\frac{1}{2}$ days, and B can do it in 6 days. In how many days can they do it working together?
9. Find the smallest number that is exactly divisible by 168, 336, and 472.
10. From $2\frac{1}{4}$ Ha of land I sold a lot containing $\frac{5}{8}$ Ha for ₱ 150. What is the remainder worth at double the rate?
11. A strip of land 30 m wide contains $\frac{3}{8}$ of a hektar. How long is it?
12. If a piece of oilcloth 5 m long and .8 m wide costs ₱ 3.20, how many square meters of the same quality can be bought for ₱ 7.20?

13. If a man travels 350 Km in 14 days of 10 hours each, in how many days of 8 hours each can he travel 400 Km?

14. What principal will amount to ₱472.50 in 1 yr. 8 mo. at $7\frac{1}{2}\%$?

15. A, B, and C hired a pasture for ₱166.50. A put in 5 horses, B 6 horses, and C 7 horses for the same length of time. How much should each have paid?

16. Twenty-four men are engaged to do a piece of work in 30 days. After 10 days, 8 men stop work. In how many days can the rest finish the work?

17. A, B, and C engaged in business for one year. A put in ₱2500, B ₱3500, and C ₱4500. At the end of six months A put in ₱2000 more, B put in ₱1000 more, and C took out ₱1000. If they gained ₱4554 during the year, what was each partner's share?

18. A note for ₱600 due in 90 days, with interest at 8%, is discounted at a bank 90 days before it is due, at 10%. Find the proceeds.

19. If the value of the ilang-ilang exported from the Philippines during 1900, 1901, and 1902 increased in the ratio of 10, 25, and 30, what was the per cent of increase for each year?

20. How much must a man invest in 4% stock at 110 that he may have an annual income of ₱1500?

21. Find the difference between the true discount and the bank discount on ₱500 due in 60 days, rate 9%.

22. Mr. Seva has bank stock on which he receives quarterly dividends of $1\frac{3}{4}\%$. What rate of interest does he receive on his investment if he bought the stock at $87\frac{1}{2}$?

23. A man sold a house and with the money bought 100 shares of mining stock at $32\frac{1}{2}\%$ below par, brokerage $\frac{1}{4}\%$. For how much did the house sell?

24. A dealer bought tobacco for ₱7500 and sold it the same day at an advance of 10 %, receiving in payment a note for the amount, payable in 90 days without interest, which he had discounted at once at a bank at 8 %. Find his gain.

25. If 14 men can do a piece of work in 40 days, how many men can do three times as much work in $\frac{2}{3}$ of the time?

26. A merchant buys goods for ₱3000 on 4 months' credit. If payment is made at the time of purchase, how much should be discounted, money being worth 9 %?

27. What is the present worth of a debt of ₱2400, $\frac{1}{4}$ of which is due now, ₱728 due in six months, and the remainder in one year, without interest, if discounted at 8 %?

28. Find the exact interest on ₱4380 from Sept. 8, 1899, to April 16, 1900, at 6 %.

29. I bought 150 shares of railroad stock at $6\frac{1}{2}$ % premium and sold them at $2\frac{1}{4}$ % discount. How much did I lose?

30. I bought bonds at $2\frac{1}{4}$ % discount, and sold them at $3\frac{1}{8}$ % premium, thus gaining ₱903. How many 100-peso bonds did I buy?

31. A broker sold for me 244 shares of stock. He took out $\frac{1}{4}$ % brokerage, and remitted me ₱26,413. At what rate did he sell the stock?

32. A man having 48 shares of 8 % stock, sold them at $122\frac{1}{2}$ and loaned the proceeds at 7 %. Did he increase or diminish his income, and how much?

33. If I invest ₱27,440 in stock selling at 112 and paying a dividend of 4 %, what is my income? What per cent do I receive on my investment?

34. Stock bought at $112\frac{1}{2}$ pays me 8 % on my investment. What per cent will the same stock pay if bought at 125?

35. A, B, and C together harvested 4165 piculs of sugar. How many piculs did each harvest if A's crop was 7 times C's, and B's was 9 times C's?

36. A farmer in Batangas has 5 Ha of land planted to rice. It cost him ₱80 for labor to plant and harvest the rice, which he sold at ₱2.75 a cavan, realizing ₱305 from his land. What was the average yield per Ha?

37. A man bought 250 cavanes of rice at ₱7 a cavan. He sold .3 of it at ₱.12 a liter, $\frac{2}{3}$ of the remainder at ₱.15 a liter, and the rest at ₱.14 a liter. How much did he gain?

38. In Albay the rice harvest during a certain month shows an average yield of 10 cavanes per Ha. If a man's land yields two crops a year at that rate, and it costs him ₱105 for labor, and rice sells for ₱3 a cavan, how many Ha must he plant to support a family of 6 for a year, at a cost of ₱.50 a day each?

39. A man sold .26 of his rice to one man and .39 of it to another and kept 70 cavanes. How many cavanes had he at first?

40. During one month in Bulacan 960 Ha of rice were harvested, which yielded 36,000 cavanes of rice. How many cavanes would a man harvest from 50 Ha that yielded at the same rate?

41. A dealer bought 420 cavanes of rice at ₱6.20 a cavan. He sold 120 cavanes at a loss of ₱.40 a cavan. For how much a cavan must he sell the remainder in order to gain ₱60 on the investment?

42. 120 cavanes of rice are sometimes produced from 1 Ha of land. If a man plants 5 Ha of such land to rice and gives $\frac{1}{6}$ of the crop for labor, for how much per cavan must he sell his rice to realize ₱2640?

43. A farmer realized ₱2500 from land planted to rice which yielded 20 cavanes per Ha. The cost of producing was $\frac{2}{3}$ of

the value of the crop and he sold his rice at ₱5 a cavan. How many Ha had he?

44. A farmer in Rizal harvested 137 cavan of corn. It cost him ₱50 for labor and he sold the corn for ₱2.10 a cavan. If he planted 5 Ha, how much per Ha did he realize from his land?

45. Three boards contain 24 board feet. They are 1" thick and 16' long. How wide are they?

46. A building 40 m by 36 m has a concrete foundation .8 m wide and 3 m high. If the cement, gravel, and sand used for making the concrete are in the ratio of 1, 5, and 2 respectively, how many cu. m of each are used?

47. Two beams 3 m 4 dm 2 cm long are spliced to make a beam 5 m 5 dm long. How long is the splice?

48. How many ft., B. M., are there in a timber 8" by 16" and 36' long?

49. What number diminished by the difference between $\frac{2}{3}$ and $\frac{7}{9}$ of itself leaves a remainder of 144?

50. A man lost 25% of his money in business and used $\frac{1}{5}$ of the remainder for household expenses, after which he had ₱1200. How much had he at first?

51. A man engaging in trade lost $\frac{2}{5}$ of his money, after which he gained ₱740 and then had ₱3500. How much did he lose?

52. Three men, A, B, and C, enter into a partnership. For every ₱5 of capital A puts in, B puts in ₱7, and C ₱3. Their whole capital amounts to ₱4230. How much money does each put in?

53. A cargo of hemp valued at ₱3475.60 was entirely lost. $\frac{1}{3}$ of it belonged to A, $\frac{1}{4}$ of it to B, and the remainder to C. How much was the loss of each if there was an insurance of ₱2512?

54. José and Pedro do a piece of work for ₱59. José can do the whole work in $2\frac{1}{4}$ weeks, and Pedro can do it in $2\frac{3}{8}$ weeks. How should the money be divided between them?

55. A grocer sold four crates of milk at ₱12 each. On two he gained 20 % and on the other two he lost 20 %. Did he gain or lose on the whole, and how much?

56. If I buy a piece of land and it increases in value each year at the rate of 25 % on the value of each previous year for 4 years, and at the end of this time is worth ₱2250, how much did it cost?

57. I bought a horse and sold it at a gain of 25 %. With the money I bought a calesa which I sold for ₱195 and lost 12 %. How much did I pay for the horse, and for the calesa?

58. I bought land for ₱30 a Ha. How much must I ask for it that I may reduce my asking price 25 % and still gain 20 %?

59. A merchant marked his goods at a gain of 20 % but was obliged to sell at 20 % less than his marked price. Did he gain or lose, and what was his per cent of gain or loss?

60. The net proceeds of a sale were ₱5635 and the commission was ₱115. What was the rate of commission?

61. A speculator received ₱2350 as the net proceeds of the sale of a farm. If his agent's commission was 6 %, what was the selling price of the farm?

62. I send my agent in Iloilo ₱1275 to invest in piña at ₱1 a meter. How many meters can he buy for me after deducting his commission of 2 %?

63. Which is more profitable and how much, to buy goods marked ₱2000 at successive discounts of 12 %, 5 %, and 2 % off, or 2 %, 8 %, and 9 % off?

64. If it costs ₱46.75 to insure a house for half its value at $1\frac{3}{8}$ %, what is the house worth?

INDUSTRIAL PROBLEMS**17. Written.**

1. A man bought 25 skeins of twisted abacá at ₱1.20 a skein and 10 k of abacá fiber at ₱.20 a k. If from this material 12 boys working 8 days at ₱.50 a day were able to make 50 pairs of slippers, for how much a pair must the slippers be sold in order to gain 25 %?

2. If the material for a pair of abacá slippers costs ₱.60, what per cent of the cost of material is the labor worth?

3. If I pay ₱1.50 a skein for fine twisted abacá and the fiber for the soles of a pair of slippers costs ₱.05 and labor is worth 125 % of the cost of material, how much twisted abacá can be used in a pair of slippers which sells for ₱1.80?

4. Juan buys 10 stalks of sugar palm petioles at ₱.01 a stalk and pays ₱.05 for nito and ₱.10 for air roots. From this material he makes in $2\frac{1}{2}$ days a basket which he sells for ₱1.50. Pedro buys $\frac{1}{2}$ a skein of twisted abacá at ₱1.20 a skein, pays ₱.02 for fiber for soles, and in 3 days makes a pair of slippers worth ₱2. Pedro's daily earnings are what per cent of Juan's?

5. If $\frac{1}{4}$ of a kilo of balangot at ₱.24 a kilo is required to make a pair of slippers that sells for 250 % of the cost of material, how many pairs must a boy make in a day in order to earn ₱.80?

6. Mr. Gonzales sold 1000 pairs of slippers, made of balangot, at ₱.30 a pair. If his labor was worth ₱.15 a pair and he used 250 kilos of balangot bought at ₱.34 a kilo, what was his gain per cent?

7. José and Segundo make 10 pairs of slippers, which they sell for ₱4. If José can make 2 pairs of slippers in 3 days and Segundo can make 4 pairs in 5 days, what per cent of the money should each receive?

8. The ratio of cost of material for a pair of slippers and a basket is 3 : 2 and material for both costs ₱1. The ratio of time required to make them is 2 : 1, and it takes 3 days to make both. For what per cent of cost must each sell so that the workman may earn ₱.50 a day?

9. I sold a pair of slippers for ₱3. It took me 5 days to make them and I used $\frac{1}{2}$ skein of twisted abacá worth ₱1.20 a skein and paid ₱.05 for fiber for soles. What per cent of the selling price was for labor and how much a day did I earn?

10. For ₱3 I bought a kilo of knotted abacá, from which I made 60 m of braid. From this braid I made 5 hats which I sold for ₱3 each. For how much each should I have sold the hats in order to increase my daily wages 20%?

11. I find I can make 2 hats of abacá braid in 3 days, thus earning ₱.80 a day. If the braid for a hat costs ₱1, what per cent of the selling price do I get for the labor?

12. If I am able to earn ₱.96 a day making hats of abacá braid at the rate of 3 in 5 days, and the braid for the hats costs $42\frac{1}{4}\%$ of the selling price, what is the selling price?

13. Gil and Felipe each buys a stem of bamboo for ₱.25 and each makes 5 hats of it. Gil makes 3 hats in 2 days, which he sells at ₱.80 each. Felipe makes 1 hat in 8 days, which he sells for ₱4.85. What per cent of Gil's daily earnings are Felipe's?

14. If I pay a man ₱.50 a day for 100 days and he cuts the buntal and makes 8 hats which I sell at an average of ₱7.80 each, what is my gain per cent?

15. If Mr. Santos hires a hat maker for 100 days at ₱.50 a day, and the hat maker is able to make only 5 buntal hats, which are sold at ₱9 each, what per cent of the cost does Mr. Santos lose?

16. A retailer bought sabutan hats at a factory for ₱6 each. For how much must he mark them so that he may reduce his marked price 20 % and still gain 20 % ?

17. A certain hat factory employed 40 men at ₱.75 a day. During one month they worked 25 days and made 150 hats of sabutan. If the sabutan for a hat costs ₱.25, for how much each must the hats be sold that the owner of the factory may gain 20 % ?

18. Mr. Garcia rents a factory for a year at ₱70 a month, buys material which costs ₱600, pays ₱8560 for labor, and during the year makes 2500 hats. At what average price must these hats retail to give a gain of 10 % to the manufacturer, 10 % to the wholesale dealer, and 25 % to the retailer ?

19. A lady paid ₱8.64 for a hat made of sabutan. If the manufacturer, the wholesale dealer, and the retailer each gained 20 % on the hat, how much did it cost the manufacturer ?

20. Some boys bought 2 piculs of abacá at ₱15 a picul and 500 pieces of nito at ₱.40 a hundred. From this material they made 30 baskets, which they sold at an average price of ₱2.50 each. What per cent of the cost of material did they get for their work ?

21. If the abacá and nito for a coiled basket costs ₱.90, for how much must the basket be sold in order to get $66\frac{2}{3}$ % of the cost for the work ?

22. A school boy made a basket from material that cost ₱.88. On account of poor workmanship, the basket had to be sold for ₱.60. What per cent of cost did the school lose ?

23. The cost of material for the baskets made in a certain school was ₱520. The baskets were marked so as to get 50 % of the cost for labor. After $\frac{1}{3}$ of them had been sold, a dis-

count of 15% was given on the remainder. How much more than the cost of material did the school receive?

24. A coiled basket made from buri raffia was sold for ₱2.45. If this price allowed 40% of the cost of material for labor, for how much should the basket have been sold in order to get 50% of the cost of material for labor?

25. It took 2 bundles of buntal for a basket and cost ₱.05 for nito used, 50% of the cost of material was allowed for labor, and the basket sold for ₱1.50. What was the cost of the buntal per bundle?

26. If maguey costs ₱15 a picul and a picul is sufficient to make 10 baskets and nito for them costs ₱1, for how much each must the baskets be sold in order to allow 25% for labor?

27. It took a boy 3 days to make a basket which he sold for ₱1.50. The cost of the dumayaka petioles, nito, and air roots used was 40% of the selling price of the basket. How much per day did the boy get for his work?

28. Juan and Pedro each made a basket from banban stems. They sold the two baskets for ₱5, Juan receiving $87\frac{1}{2}\%$ as much as Pedro. How much did each receive?

29. Balangot costs ₱.40 a kilo and 4 pairs of slippers can be made from a kilo. Twisted abacá costs ₱1.20 a skein and a skein will make two pairs of slippers. If the balangot slippers sell for ₱.40 a pair and a boy can make 2 pairs a day, and abacá slippers sell for ₱2 and it takes the same boy 5 days to make a pair, which would give the boy the higher daily wages, and how much?

30. Mr. Santos made 10 round mats in 100 days. The material used was 20 kilos of tikug worth ₱.30 a kilo. An agent sold the mats on 15% commission. If the agent's commission was ₱9, how much did Mr. Santos earn per day?

POWERS AND ROOTS

POWERS

18. Oral.

$$3 \times 3 = 9$$

$$3 \times 3 \times 3 = 27$$

$$3 \times 3 \times 3 \times 3 = 81$$

9, 27, and 81 are powers of 3.

A **power** is a product of equal factors.

1. What is the product of 4 taken twice as a factor, or what is the second power of 4?

2. What is the product of 3 taken three times as a factor, or what is the third power of 3?

3. What is the product of 2 taken 4 times as a factor, or what is the fourth power of 2?

A power is named according to the number of its equal factors.

The product of two equal factors is the second power, or **square**, of the number used as a factor. The product of three equal factors is the third power, or **cube**, of the number used as a factor. The powers above the third are called simply fourth, fifth, etc.

The second power is called a square because the area of a square is the product of two equal factors, length and breadth; and the third power is called a cube because the volume of a cube is the product of three equal factors, length, breadth, and thickness.

An **exponent** is a small figure placed at the right and a little above a number to show how many times the number is to be used as a factor, or what power of the number is to be found.

7^5 is read, the fifth power of 7. $(\frac{1}{2})^2$ is read, the square of $\frac{1}{2}$. 4^3 is read, the cube of 4. 5, 2, and 3 are exponents.

4. Learn the squares of the numbers from 1 to 25.

5. Learn the cubes of the numbers from 1 to 10.

19. Written.*Find the following powers :*

- | | | | | |
|----------|----------|--------------|------------------------|------------------------|
| 1. 6^3 | 5. 9^4 | 9. $.02^4$ | 13. $(\frac{2}{3})^4$ | 17. 1.01^3 |
| 2. 4^5 | 6. 5^6 | 10. 3.5^3 | 14. $(\frac{1}{6})^3$ | 18. $(1\frac{1}{4})^2$ |
| 3. 2^8 | 7. 3^7 | 11. $.004^3$ | 15. $(4\frac{1}{4})^2$ | 19. 7.7^4 |
| 4. 7^4 | 8. 8^5 | 12. 1.09^3 | 16. $(3\frac{5}{8})^3$ | 20. $(9\frac{1}{9})^3$ |

ROOTS**20. Oral.**

- What are the two equal factors of 9? Of 36? Of 81?
- What are the two equal factors of 16? Of 64? Of 100?
- What are the three equal factors of 8? Of 64? Of 125?
- What are the four equal factors of 16? Of 81? Of 10,000?

A **root** of a number is one of its equal factors.

The **square root** of a number is one of its two equal factors; the **cube root**, one of its three equal factors; the **fourth root**, one of its four equal factors; etc.

The **radical sign** ($\sqrt{}$) placed before a number indicates that its root is to be found.

The **index** of the root is a small figure placed in the opening of the radical sign to show what root is to be found.

When the index is omitted, the square root is indicated.

$\sqrt{25} = 5$ is read, "the square root of 25 is 5"; $\sqrt[3]{64} = 4$ is read, "the cube root of 64 is 4"; $\sqrt[4]{625} = 5$ is read, "the fourth root of 625 is 5."

Give the following roots:

- | | | | | |
|-------------------|--------------------|---------------------|----------------------|------------------------|
| 5. $\sqrt{100}$ | 8. $\sqrt[3]{64}$ | 11. $\sqrt[3]{125}$ | 14. $\sqrt[3]{32}$ | 17. $\sqrt[3]{8000}$ |
| 6. $\sqrt{144}$ | 9. $\sqrt{81}$ | 12. $\sqrt[4]{81}$ | 15. $\sqrt[3]{1000}$ | 18. $\sqrt{1600}$ |
| 7. $\sqrt[3]{27}$ | 10. $\sqrt[4]{16}$ | 13. $\sqrt{625}$ | 16. $\sqrt[4]{256}$ | 19. $\sqrt[3]{27,000}$ |

Square Root

21. Oral.

$1^2 = 1$

$10^2 = 100$

$100^2 = 10,000$

$9^2 = 81$

$99^2 = 9801$

$999^2 = 998,001$

From the above illustrations we see that the square of a number of one figure contains either one or two figures; the square of a number of two figures contains either three or four figures; etc.

Hence, if the figures of a number be separated into groups of two figures each, beginning at the decimal point, the number of groups will show the number of figures in the square root of the number.

If the number is a whole number, the left-hand group may contain either one or two figures.

How many figures are there in the square root of:

1. 144?

4. 256?

7. 40,000?

10. 12,100?

2. 81?

5. 1600?

8. 250,000?

11. 19,600?

3. 169?

6. 4900?

9. 3600?

12. 360,000?

In finding the square of a number containing tens and units, we may separate the tens and units.

$$\text{Thus } 26^2 = (20 + 6)^2.$$

$20 + 6$

$t = \text{tens}$

$u = \text{units}$

$20 + 6$

$t + u$

$20^2 + (20 \times 6)$

$t + u$

$+ (20 \times 6) + 6^2$

$t^2 + (t \times u)$

$20^2 + 2 \times (20 \times 6) + 6^2$

$+ (t \times u) + u^2$

$400 + 240 + 36 = 676$

$t^2 + 2 \times (t \times u) + u^2$

Hence, the square of a number composed of tens and units is equal to the square of the tens + twice the tens times the units + the square of the units.

$$t^2 + 2 \times (t \times u) + u^2 \text{ may be written, } t^2 + (2 \times t + u) \times u.$$

13. Separate the following into tens and units and find their squares, using the formula, $t^2 + 2 \times (t \times u) + u^2$: 12, 15, 22, 24, 31, 33, 45, 52, 64, 71, 85, 91.

22. Oral.

The area of a square is the product of two equal factors, length and breadth.

Finding the square root of a number, therefore, is equivalent to finding the length of one side of a square whose area is the given number.

Find the length of one side of a square whose area is 1156 sq. m.

Since the number contains four figures, its square root will contain two figures—tens and units. In the diagram:

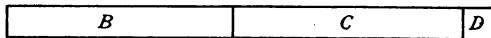
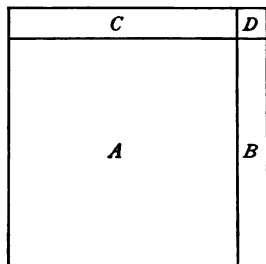
$$A = \text{tens}^2, D = \text{units}^2,$$

$$B = \text{tens} \times \text{units}, C = \text{tens} \times \text{units}.$$

$$A + B + C + D = t^2 + 2 \times (t \times u) + u^2.$$

900, the square of 30, is less than 1156, and 1600, the square of 40, is greater than 1156. Therefore, the length of one side of the square whose area is 1156 sq. m lies between 30 m and 40 m.

The greatest square of tens in 1156 sq. m is 900 sq. m (A). The length of one side of A is 30 m.



$$1156 \text{ sq. m} - 900 \text{ sq. m} = 256 \text{ sq. m}.$$

The area of $B + C + D = 256$ sq. m. The width of rectangle B is to be found. Since the tens of the root have been found, the width of B will be the units of the root.

The area of $B = 30 \times \text{units}$. The area of $C = 30 \times \text{units}$. The area of $D = \text{units} \times \text{units}$. The area of $B + C + D = \text{units} \times (2 \times 30 + \text{units})$. Therefore $\text{units} \times (2 \times 30 + \text{units}) = 256$ sq. m.

Using 2×30 for a trial divisor, we find units equal to 4 + . $4 \times (2 \times 30 + 4) = 4 \times 64 = 256$. Thus the length of one side of A is 30 m, of D is 4 m, and, therefore, one side of the large square is 34 m.

23. Written.

What is the square root of 1764?

$$\begin{array}{r}
 17'64 \) \ 42 \\
 \underline{16 \ 00} \\
 1 \ 64 \\
 \underline{1 \ 64} \\
 0
 \end{array}$$

Trial divisor ($2 \times t$) = $2 \times 40 = 80$
 $u = 2$
 Complete divisor ($2 \times t + u$) = 82

Separating the number into groups of two figures each, we find two groups; then we know there are two figures in its square root.

The greatest perfect square in 17 is 16, which is the square of 4; hence 4 is the tens' figure of the root.

Subtracting the square of 4 tens, 1600, from 1764 leaves 164, the dividend.

By the formula on page 188, 164 is composed of $(2 \times t + u) \times u$.

To obtain the units' figure of the root, we use $2 \times t$, or 80, as a trial divisor. The quotient is 2 +. We infer that the units' figure of the root is 2.

To obtain the complete divisor, we add the units' figure, 2, to the trial divisor. $80 + 2 = 82$.

Multiplying the complete divisor by the units' figure of the root, the product is 164, which, subtracted from the dividend, leaves no remainder.

Therefore, the square root of 1764 is 42.

$$\begin{array}{r}
 29'.05'21 \) \ 5.39 \\
 \underline{25} \\
 103 \ 4 \ 05 \\
 \underline{3 \ 09} \\
 1069 \ 96 \ 21 \\
 \underline{96 \ 21} \\
 0
 \end{array}$$

Trial divisor = 2×50
 Trial divisor = 2×530

$$\begin{array}{r}
 25'30'.09 \) \ 50.3 \\
 \underline{25} \\
 1003 \ 30 \ 09 \\
 \underline{30 \ 09} \\
 0
 \end{array}$$

Trial divisors $\begin{cases} 2 \times 50 \\ 2 \times 500 \end{cases}$

$$\begin{array}{r}
 81'14'40'.64 \) \ 900.8 \\
 \underline{81} \\
 18008 \ 14 \ 40 \ 64 \\
 \underline{14 \ 40 \ 64} \\
 0
 \end{array}$$

Trial divisors $\begin{cases} 2 \times 90 \\ 2 \times 900 \\ 2 \times 9000 \end{cases}$

RULE FOR FINDING THE SQUARE ROOT OF A NUMBER

(1) Beginning at the decimal point, separate the number into groups of two figures each.

(2) Find the greatest square in the left-hand group, and write its square root as the first figure of the required root.

(3) Subtract this square from the left-hand group, and to the remainder annex the next group for a dividend.

(4) Considering the root already found as tens, multiply it by 2 for a trial divisor.

(5) Divide the dividend by the trial divisor to obtain the next figure of the root.

(6) Add this figure of the root to the trial divisor to obtain the complete divisor.

(7) Multiply this complete divisor by the last figure of the root, subtract the product from the dividend, and annex the next group to the remainder.

(8) Repeat (4) to (7) until all the groups have been used.

If after multiplying by any root figure, the product is larger than the dividend, the root figure must be diminished.

If the number contains a decimal, beginning at the decimal point separate it into groups of two figures each to the right and left. If the right-hand decimal group is not complete, annex a cipher. There will be as many decimal places in the root as there are decimal groups in the number.

When 0 occurs in the root, annex 0 to the trial divisor, bring down the next group, and divide as before.

To find the square root of a common fraction, take the square root of its terms separately. If the terms are not perfect squares, change the common fraction to a decimal and take the square root of the decimal.

Change a mixed number to decimal form before taking its square root.

The reverse of the short rule for squaring numbers of two places ending in 5 (see page 155), can be used to find mentally the square roots of perfect squares less than 10,000, ending in 25. Thus $\sqrt{625} = 25$, $\sqrt{1225} = 35$, $\sqrt{3025} = 55$, $\sqrt{5625} = 75$, $\sqrt{9025} = 95$, $\sqrt{20.25} = 4.5$, $\sqrt{42.25} = 6.5$, etc.

.00'22'44'86'44).04738

Trial divisor = 2×40

16
87 $\overline{) 6\ 44}$
6 09

Trial divisor = 2×470

943 $\overline{) 35\ 86}$
28 29

Trial divisor = 2×4730

9468 $\overline{) 7\ 57\ 44}$
7 57 44

Find the square root of:

- | | | | |
|---------|-------------|---------------|--------------------------------|
| 1. 1369 | 8. 12544 | 15. 25.3009 | 22. $\overline{) 64}$
144 |
| 2. 2025 | 9. 15625 | 16. 52.577001 | 23. $\overline{) 169}$
225 |
| 3. 5476 | 10. 17956 | 17. 7404.6025 | 24. $\overline{) 576}$
825 |
| 4. 7396 | 11. 46656 | 18. 398665.96 | 25. $\overline{) 289}$
1600 |
| 5. 8464 | 12. 106929 | 19. .25270729 | 26. $\overline{) 441}$
1521 |
| 6. 6241 | 13. 1900.96 | 20. 5596.5361 | 27. $\overline{) 876}$
1936 |
| 7. 7744 | 14. 7603.84 | 21. .00007921 | 28. $\overline{) 81}$
2601 |

24. Written.

Find to three decimal places:

Square root of 3.

$3'.00'00)\underline{1.732}+$
1
27 $\overline{) 2\ 00}$
1 89
343 $\overline{) 11\ 00}$
10 29
3462 $\overline{) 71\ 00}$
69 24
1 76

Square root of 6.

$6'.00'00)\underline{2.449}+$
4
44 $\overline{) 2\ 00}$
1 76
484 $\overline{) 24\ 00}$
19 36
4889 $\overline{) 4\ 64\ 00}$
4 40 01
23 99

Find to three decimal places the square root of:

- | | | | | | |
|---------|----------|-----------|------|----------|----------|
| 1. .13 | 3. 1.256 | 5. .00253 | 7. 2 | 9. 7 | 11. 1.63 |
| 2. .056 | 4. 8.21 | 6. 1.1 | 8. 5 | 10. .024 | 12. 3.2 |

Applications of 'Square Root**25. Written.**

Draw diagrams of the lots, fields, etc., involved in the following problems.

1. Find the length of one side of a square field that contains 62,500 sq. m.

2. Find in meters the length of one side of a square field containing $56\frac{1}{4}$ hektars.

3. A rectangular lot is 72 m long and 50 m wide. Find the length of one side of a square lot having the same area.

4. What is the perimeter of a square lot containing 529 sq. m? What is the perimeter of a square lot of four times this area?

The perimeter of a figure is the sum of its sides.

5. From one corner of a square field containing 9 Ha the owner sold a square lot containing $\frac{1}{4}$ Ha. Find the perimeter of the original field, of the lot sold, and of the part of the field remaining after the lot was sold. Draw the plan of the field and lot.

6. A square court contains $272\frac{1}{4}$ sq. m. A square flower bed in its center covers $\frac{1}{9}$ of its area. Find the perimeter of the court and of the flower bed.

7. What is the perimeter of a square farm containing 21.16 Ha? What is the perimeter of a square farm of 9 times this area? The second perimeter is how many times the first?

8. A lot three times as long as it is wide contains 1200 sq. m. What is its perimeter?

9. A field five times as long as it is wide contains 24.2 Ha. How long and how wide is it?

10. A field $2\frac{1}{2}$ times as long as it is wide contains .1 Ha. How long and how wide is it?

26. Oral.

A **right-angled triangle** is a triangle containing a right angle.

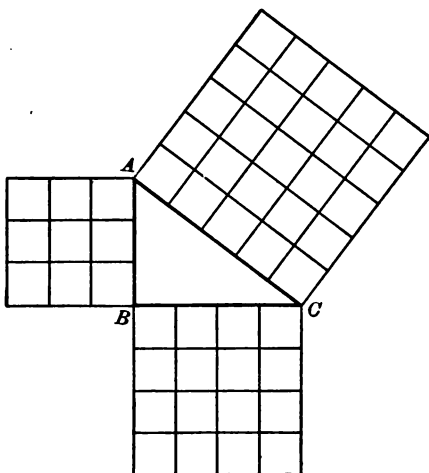
The side opposite the right angle is the **hypotenuse**, as AC . AB is the **perpendicular**, and BC is the **base**.

In the triangle ABC , the hypotenuse is 5 cm, the perpendicular is 3 cm, and the base is 4 cm.

It is seen that the square of the hypotenuse, 25 sq. cm, is equal to the square of the base, 16 sq. cm, plus the square of the perpendicular, 9 sq. cm.

In a right-angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Therefore, to find the hypotenuse, extract the square root of the sum of the squares of the other two sides.



$$\sqrt{\text{Base}^2 + \text{Perpendicular}^2} = \text{Hypotenuse. } \sqrt{16 + 9} = 5.$$

The base of a right-angled triangle is 20 m, and the perpendicular is 15 m. What is the hypotenuse?

$$20^2 + 15^2 = 625. \quad \sqrt{625} = 25, \text{ or } \sqrt{20^2 + 15^2} = 25.$$

27. Written.

1. How long is the diagonal of a rectangle 76 m by 57 m?
2. The two sides of a right-angled triangle are 100 cm and 75 cm. Find the hypotenuse.

3. A rectangular garden 135 m by 72 m has a straight path joining two opposite corners: Find the length of the path.

4. From the top of a pole 16 ft. high a wire is drawn to a stake in the ground 30 ft. from the foot of the pole. What is the length of the wire?

5. The surface of the six equal faces of a cube is 7350 sq. cm. What is the length of an edge of the cube? Of a diagonal of one face?

To find the base or the perpendicular, extract the square root of the square of the hypotenuse diminished by the square of the other side.

$$\sqrt{\text{Hypotenuse}^2 - \text{Perpendicular}^2} = \text{Base.} \qquad \sqrt{25 - 9} = 4$$

$$\sqrt{\text{Hypotenuse}^2 - \text{Base}^2} = \text{Perpendicular.} \qquad \sqrt{25 - 16} = 3$$

6. The hypotenuse of a right-angled triangle is 39 dm and the base is 15 dm. Find the perpendicular.

7. A ladder 18 m long reaches the top of a tower 12 m high. How far from the foot of the tower is the foot of the ladder?

8. What is the base of a triangle, if the hypotenuse is 35 cm and the perpendicular 20 cm?

9. The sides about the right angle of a right-angled triangle are 12 m and 4 m respectively. Find the length of the hypotenuse to two decimal places.

10. A square farm contains 6.25 Ha. What is the diagonal distance between its opposite corners?

11. What is the perpendicular of a right-angled triangle whose hypotenuse is 45 m and whose base is 22 m?

12. From the same point A traveled east 150 Km, and B south 100 Km. How far apart were they?

13. What is the length of the diagonal of a cube whose edge is 5 cm?

LINES, SURFACES, AND VOLUMES

LINES

28. Oral.

Have these definitions read, discussed, and illustrated in the class, but do not require them all to be memorized at once.

A **line** is the path of a moving point. It has length only.

A **straight line** is a line that does not change its direction.

A **curved line** is a line that changes its direction at every point.

A **horizontal line** is a line that is parallel to the horizon or water level.

A **perpendicular line** is a line that meets another line or a surface so as to form equal angles with it.

A **vertical line** is a line that is perpendicular to the horizon or to still water.

An **angle** is the opening between two lines that meet.

The **vertex** of the angle is the point where the two lines meet.

A **right angle** is an angle formed by two perpendicular lines.

An **acute angle** is an angle that is smaller than a right angle.

An **obtuse angle** is an angle that is larger than a right angle.

SURFACES

29. Oral.

A **surface** is that which has two dimensions, length and breadth.

A **plane surface** is a surface that does not change its direction.

A **curved surface** is a surface no part of which is plane.

A **plane figure** is a portion of a plane surface bounded by lines.

A **polygon** is a plane figure bounded by three or more straight lines.

A **regular polygon** is a polygon that has equal sides and equal angles.

The **perimeter** of a polygon is the sum of its sides.

A **diagonal** of a polygon is a straight line joining any two vertices that are not adjacent.

Polygons are classified as triangles, quadrilaterals, pentagons, hexagons, etc., according to the number of sides of each.

30. Oral.

Give a definition for each of the following :

- | | |
|--|---------------------------------|
| 1. Triangle. | 6. Base of a parallelogram. |
| 2. Base of a triangle. | 7. Altitude of a parallelogram. |
| 3. Altitude of a triangle. | 8. Rectangle. |
| 4. Quadrilateral. | 9. Square. |
| 5. Parallelogram. | 10. Trapezoid. |
| 11. How do you find the area of a triangle? Of a parallelogram? Of a trapezoid? Of a square? | |

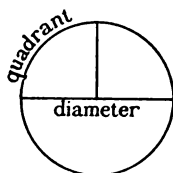
Have the pupils cut the above figures from paper and draw them on paper and on the blackboard.

Give the areas of the following polygons :

- Rectangle, 25 m long, $3\frac{1}{5}$ m wide.
- Triangle, base 28 m, altitude 20 m.
- Parallelogram, base 120 cm, altitude $4\frac{1}{2}$ cm.
- Trapezoid, parallel sides 60 ft. and 30 ft., altitude 100 ft.
- Square, side $\frac{3}{4}$ Km.
- Triangle, base 240 dm, altitude 50 dm.
- Trapezoid, parallel sides 22 in. and 32 in., altitude 10 in.

31. Written.

1. A city lot in the shape of a triangle whose base is 30 m contains .12 Ha. What is its altitude?
2. Find the length in meters of a rectangular floor whose area is 31 sq. m and whose width is 5 m.
3. A rectangular field is 135 m long and its area is 1.62 Ha. What will it cost to fence it at ₱.18 per meter?
4. A field 140 m long and 80 m wide costs ₱100.80. At the same rate, what will be the cost of a field 200 m long and 160 m wide?
5. Find the side of a square whose area is equal to the sum of the areas of two squares, the sides of which are 12 m and 16 m respectively.
6. How many meters of fence will it take to inclose a square lot whose diagonal is 50 m?
7. Through the middle of a rectangular garden 240 m by 80 m two paths are made perpendicular to each other and parallel to the sides of the garden, each 2.2 m wide. Find the area of the paths and the area of the rest of the garden.
8. Find the total surface of a cube whose edge is 25 cm. Find its diagonal.
9. A rectangular field is four times as long as it is wide, and contains .25 Ha. What is the length of its diagonal?
10. The base of a right-angled triangle containing 300 sq. cm is 30 cm. What is its altitude? Its perimeter?
11. What is the diagonal of a crayon box 6 in. long, 4 in. wide, and 4 in. high?
12. What is the area of a lot in the shape of a right-angled triangle whose base is 60 m and whose hypotenuse is 75 m?

32. Oral.

CIRCLE

A **circle** is a plane figure bounded by a curved line, called the **circumference**, all points of which are equally distant from the center.

Define *diameter*, *radius*, *arc*, *quadrant*.

Have the pupils measure around and across circular objects until they can determine an approximate relation between the circumference and diameter of a circle. This may also be determined by rolling a cardboard circle on a plane, thus obtaining a straight line equal to the circumference of the circle.

Show the pupils how to draw circles with crayon and string, and emphasize the fact that the length of the string used equals the radius of the circle.

The ratio of the circumference of any circle to its diameter is about 3.1416. (In oral examples, $3\frac{1}{7}$ is sufficiently accurate.)

In mathematics, 3.1416 is represented by the Greek letter π .

1. How can you find the circumference of a circle when the diameter is given? When the radius is given?

2. How can you find the diameter of a circle when the circumference is given?

3. How can you find the radius of a circle when the circumference is given?

Using the ratio $3\frac{1}{7}$, give the approximate circumferences of the following circles :

- | | |
|---------------------|------------------------------|
| 4. Diameter 7 cm. | 11. Diameter 280 Km. |
| 5. Diameter 21 cm. | 12. Diameter 350 m. |
| 6. Diameter 28 m. | 13. Radius $3\frac{1}{2}$ m. |
| 7. Diameter 42 Km. | 14. Radius 21 m. |
| 8. Diameter 35 m. | 15. Radius 14 m. |
| 9. Diameter 70 m. | 16. Radius 35 m. |
| 10. Diameter 140 m. | 17. Radius 2 m. |

33. Written.

Using the ratio 3.1416, find the circumferences of the following circles:

1. Diameter 50 cm. 6. Diameter 1.5 cm. 11. Diameter 165 ft.
2. Diameter 75 cm. 7. Diameter $12\frac{1}{2}$ m. 12. Radius 62 ft.
3. Diameter 22 cm. 8. Diameter 10.4 cm. 13. Radius $22\frac{1}{2}$ in.
4. Diameter 41 m. 9. Diameter $37\frac{1}{2}$ m. 14. Radius 44.4 m.
5. Diameter 33 m. 10. Diameter $.62\frac{1}{2}$ m. 15. Radius 112.25 ft.

16. The circumference of a circular plot of ground is 78.54 m. What is its diameter? Analyze.

17. If the circumference of a circular card is 100.5312 cm, what is its radius?

18. At ₦.50 a meter, what will it cost to fence a circular plot of ground 100 m in diameter?

19. A cow is tied to a stake by a rope 15 m long. Find the circumference of the plot over which she can graze.

20. What is the circumference of the largest circle that can be drawn on a rectangle 29 cm wide?

21. The diameter of a wheel is 150 cm. How many turns will it make in going 9424.8 m?

22. In going three times around a circular race track, a horse travels 1 Km. Find in meters the diameter of the circle around which the horse travels.

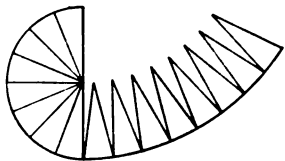
23. The extreme point of the minute-hand of a large clock travels 157.08 cm in one hour. What is the length of the hand?

24. A car wheel is 75 cm in diameter. How many times does it turn in a minute when the car is traveling at the rate of 22,619.52 m per hour?

25. What is the diameter of a tree that is 392.7 cm in circumference?

34. Written.

A circle may be regarded as composed of a large number of triangles. The sum of the bases of these triangles equals the circumference of the circle, and the altitude of each triangle equals the radius of the circle.



Thus, the sum of the areas of these triangles equals $\frac{1}{2}$ of the circumference times the radius.

It can easily be shown that $\frac{1}{2}$ of the circumference times the radius = π times the square of the radius. Hence, the area of a circle equals π times the square of the radius.

The diameter of a circle is 20 m. What is its area?

Radius = 10 m. $3.1416 \times 10^2 = 314.16$. Area = 314.16 sq. m.

Find the areas of the following circles:

1. Diameter 10 cm.
2. Diameter 30 cm.
3. Diameter 40 m.
4. Diameter 25 m.
5. Diameter 31 dm.
6. Diameter 55 m.
7. Diameter 120 cm.
8. Diameter 210 m.
9. Radius 40 m.
10. Radius $7\frac{1}{2}$ cm.
11. Radius $22\frac{1}{2}$ m.
12. Radius $102\frac{1}{2}$ m.
13. Circumference 125.664 cm.
14. Circumference 785.4 dm.
15. How many hektars are there in a circular field whose diameter is 200 m?
16. The radius of a circular plot of ground is 75 m. Find its circumference and its area.
17. How many square centimeters are there in a circular mirror 62.832 cm in circumference?
18. A boy has a stone tied to the end of a string 3 m long. As he swings it around, what is the area of the circle described?

VOLUMES

35. Oral.

A **solid** is anything that has three dimensions—length, breadth, and thickness.

The **volume** of any solid is the number of cubic units it contains.

The surfaces that bound a solid are called its **faces** and their intersections its **edges**.

A **prism** is a solid whose bases are equal, parallel polygons, and whose sides are parallelograms.

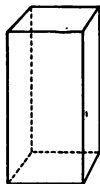
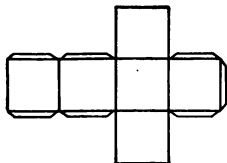
The parallelograms taken together form its **lateral surface**.

Prisms are named from the shapes of their bases, triangular, square, rectangular, hexagonal, etc.

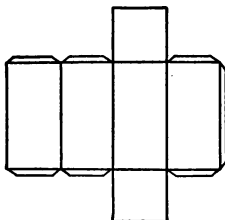
The **altitude** of a prism is the perpendicular distance between its bases.

1. A cube is what kind of a prism?
2. A chalk box is what kind of a prism?
3. Name some kinds of prisms you have seen.
4. Cut from cardboard, fold, and paste rectangular and triangular prisms according to the patterns given below.

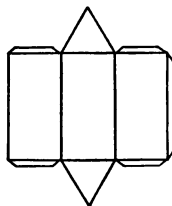
Give your pupils the dimensions you wish them to use in making these models.

RECTANGU-
LAR PRISMTRIANGU-
LAR PRISM

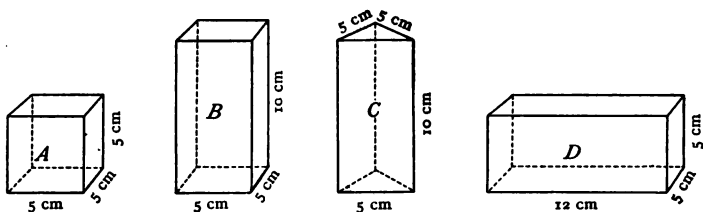
CUBE



SQUARE PRISM



TRIANGULAR PRISM



5. What is the entire surface of A if each edge is 5 cm?
6. What is the lateral surface of B ? The entire surface?
7. What is the lateral surface of C ?
8. What is the lateral surface of D ? The area of the two bases? The entire surface?
9. How do you find the lateral surface of a prism? The entire surface?

36. Written.

The volume of a prism is equal to the area of its base times its altitude.

An explanation of this may be given similar to that given on page 104 of Complete Arithmetic, Part I.

1. Find the volume of a prism whose base is $6\frac{1}{2}$ cm square and whose altitude is $7\frac{1}{2}$ cm.
2. What is the lateral surface of a triangular prism the perimeter of whose base is 13 in. and whose altitude is 20 in.?
3. Find the entire surface and volume of a triangular prism the sides of the base being 3 cm, 4 cm, and 5 cm, respectively, and the altitude 9 cm.
4. The area of one face of a cube is 5700.25 sq. cm. Find its entire surface and its volume.
5. The total surface of a cube is 3750 sq. cm. What is its volume?

37. Written.

A **cylinder** is a solid whose bases are equal, parallel circles, and whose lateral surface is curved.

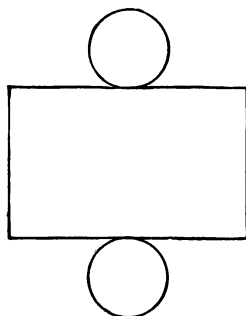
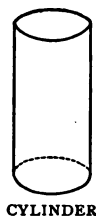
In this book "cylinder" means "circular cylinder."

The lateral surface of a cylinder is equal to the circumference of the base times the altitude.

Show that the lateral surface of a cylinder is equal to a rectangle which has for its base the circumference of the base of the cylinder, and for its altitude the altitude of the cylinder, by covering the lateral surface with paper and opening the paper.

The volume of a cylinder is equal to the area of its base times its altitude.

1. What is the lateral surface of a cylinder whose diameter is 10 cm and whose altitude is 15 cm?
2. Find the entire surface of a cylinder whose diameter is 30 cm and whose altitude is 50 cm.
3. What will it cost, at ₦2.50 per square meter, to polish the lateral surface of a granite cylindrical column .35 m in diameter and 4.3 m long?
4. What is the volume of a cylinder whose diameter is 25 cm and whose altitude is 36 cm?
5. What is the capacity in hektoliters of a cylindrical cistern 1.5 m in diameter and 4 m deep?
6. What must be the depth of a cylindrical can which holds 19,635 liters and is 25 cm in diameter?
7. A water supply company wishes to erect a cylindrical tower which will hold 4400 hektoliters. If it is 5 m in diameter, how high must the tower be? (Use the ratio $3\frac{1}{2}$.)

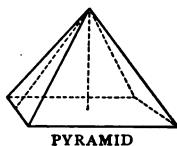


38. Written.

A **pyramid** is a solid whose base is a polygon and whose lateral faces are triangles meeting at a point called the **vertex** of the pyramid.

Pyramids, like prisms, are named from the shapes of their bases, triangular, square, etc.

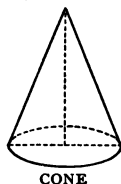
In this book "pyramid" means "regular pyramid."



The **altitude** of a pyramid is the perpendicular distance from its vertex to its base.

The **slant height** of a pyramid is the altitude of the triangles forming its lateral surface.

See that your pupils do not confuse altitude of pyramid and altitude of triangle.



A **cone** is a solid whose base is a circle and whose lateral surface tapers uniformly to a point called the vertex of the cone.

In this book "cone" means "circular cone."

The **altitude** of a cone is the perpendicular distance from its vertex to its base.

The lateral surface of a pyramid is composed of a number of triangles, the sum of whose bases equals the perimeter of the base of the pyramid, and whose altitude equals the slant height of the pyramid.

The lateral surface of a cone may be thought of as composed of a large number of triangles with very short bases.

The lateral surface of a pyramid or cone is equal to one half the product of its slant height and the perimeter of its base.

Take a hollow prism and a hollow pyramid of the same base and altitude. Fill the pyramid with sand and pour it into the prism. Since this must be done three times to fill the prism, the volume of the pyramid is one third the volume of the prism.

In the same way it may be shown that the volume of a cone is one third the volume of a cylinder of the same base and altitude.

The volume of a pyramid or cone is equal to one third the volume of a prism or cylinder of the same base and altitude; or is equal to one third of the area of the base times the altitude.

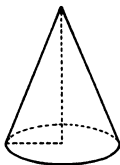
Find the lateral and entire surfaces of the following solids. Find results to two decimal places.

1. Pyramid, base 24 cm square, slant height 20 cm.
2. Pyramid, base $2\frac{1}{2}$ dm square, slant height 4 dm.
3. Pyramid, base 32 in. square, slant height 25 in.
4. Cone, diameter of base 15 cm, slant height 16 cm.
5. Cone, radius of base 10 cm, slant height 20 cm.
6. Cone, circumference of base 94.248 cm, slant height 20 cm.
7. What is the lateral surface of a triangular pyramid whose base is 5 in. on each side, and whose slant height is 20 in.?
8. What is the lateral surface of a pyramid whose base is a hexagon 4 dm on each side, and whose slant height is 15 dm?

Find the volume of each of the following solids:

9. Pyramid, base 12 cm square, altitude 12 cm.
10. Pyramid, base $3\frac{1}{2}$ dm square, altitude 9 dm.
11. Pyramid, base 40.5 cm square, altitude 50 cm.
12. Cone, diameter of base 14 ft., altitude 15 ft.
13. Cone, radius of base 4 cm, altitude 12 cm.
14. Find the entire surface and volume of a cone whose base is 12 cm in diameter, and whose slant height is 10 cm.

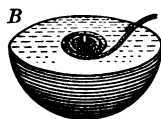
The slant height and radius of the base are the hypotenuse and base of a right-angled triangle whose altitude is the altitude of the cone.



15. Find the entire surface and volume of a pyramid whose base is 12 cm square and whose altitude is 8 cm.

39. Written.

A sphere is a solid bounded by a curved surface, all points of which are equally distant from the center.



Take two wooden hemispheres of equal size. Drive a tack into the center of the curved surface of one, as at *A*, and a second tack into the center of the flat surface of the other, as at *B*. Wind cords closely about these two surfaces until they are exactly covered. If this is carefully done, it will be found that the cord wound about *A* is twice the length of the cord wound about *B*.

Since the circle whose center is *B* has the same diameter as the sphere, it is evident that the surface of the sphere is equivalent to the sum of 4 circles whose diameters equal the diameter of the sphere.

The area of a circle is $\pi \times \text{radius}^2$.

Hence, the surface of a sphere is $4 \times \pi \times \text{radius}^2$.

Find the surfaces of the following spheres :

- | | |
|--|--------------------|
| 1. Diameter 10 cm. | 5. Radius 35 in. |
| 2. Diameter 21 cm. | 6. Radius 12.5 cm. |
| 3. Diameter 15 ft. | 7. Radius 4.5 dm. |
| 4. Diameter 14 cm. | 8. Radius 1.05 ft. |
| 9. What is the diameter of a ball whose surface is 5026.56 sq. cm? | |

A sphere may be regarded as composed of pyramids whose bases taken together form the surface of the sphere, and whose altitude is the radius of the sphere.



Since the volume of a pyramid is the product of the base and $\frac{1}{3}$ of the altitude, the volume of a sphere is equal to the product of the surface and $\frac{1}{3}$ of the radius.

The surface of a sphere is $4 \times \pi \times \text{radius}^2$.

Hence, the volume of a sphere is $\frac{4}{3} \times \pi \times \text{radius}^3$.

Find the volumes of the following spheres :

- | | |
|---------------------|---------------------|
| 10. Radius 6 cm. | 15. Diameter 10 cm. |
| 11. Radius 4.5 cm. | 16. Diameter 15 in. |
| 12. Radius 1.05 ft. | 17. Diameter 25 cm. |
| 13. Radius 3.5 in. | 18. Diameter 21 in. |
| 14. Radius 12 dm. | 19. Diameter 50 cm. |

20. How much clay would be needed to mold 15 spheres each 4 cm in diameter?

21. What will be the weight of 3 dozen marbles each 2 cm in diameter, if the specific gravity of the material is 4.2?

22. The circumference of a sphere is 18.8496 cm. What is its volume?

23. If the specific gravity of iron is 7.8, what is the weight of a 15-cm cannon-ball?

24. What is the surface of a ball whose circumference is 50.2656 cm?

25. The volume of a ball 10 cm in diameter is what decimal part of the volume of a cube whose edge is 10 cm?

26. The diameter of a sphere is 20 cm. Find the circumference of a great circle. The surface of the sphere. The volume.

27. Find the weight of a lead ball whose circumference is 31.416 cm. The specific gravity of lead is 11.4.

28. What is the ratio between the volume of a sphere 20 cm in diameter and that of a cylinder 20 cm in diameter and 20 cm high? (Indicate the volume of each and cancel.)

29. What is the diameter of a sphere if $1\frac{1}{2}\pi$ times its radius is 381.7044 cu. in.?

30. Find the diameter of a sphere whose surface is 50.2656 sq. ft. Find its volume. Find its weight if the material weighs 200 pounds per cubic foot.

REVIEW

40. Written.

1. Find the surface and the volume of a cube whose edge is 11 in.
2. What is the volume of a prism whose base is 8 cm square and whose altitude is 12.5 cm? What is its entire surface?
3. A cylinder 10 cm in diameter is 15 cm high. Find its solid contents. Its entire surface.
4. Find the volume of a pyramid whose base is 8.2 in. square and whose altitude is 12 in.
5. What is the volume of a cone whose altitude is 18 cm and the diameter of whose base is 15 cm?
6. How many liters of water will it take to fill a hollow sphere whose inside diameter is 25 cm?
7. What is the entire surface of a pyramid whose base is 7.5 cm square and whose slant height is 11 cm?
8. Find the entire surface of a cone whose base is 10 in. in diameter and whose slant height is 12.4 in.
9. What will it cost to gild a ball 2 ft. in diameter at ₱.60 per square foot?
10. The volume of a prism is 1280 cu. in. Its base is 8 in. square. Find its height and its entire surface.
11. The volume of a cylinder is 1570.8 cu. cm. Its diameter is 10 cm. What is its altitude?
12. The volume of a prism is 1500 cu. in. Its base is 12.5 in. by 8 in. What is its height? Its entire surface?
13. If the volume of a cone is 3534.3 cu. in., and the diameter of its base is 15 in., what is its altitude?
14. How many cubic feet are there in a log that measures 2 ft. in diameter and is 25 ft. long?

15. At ₱1.80 per sq. m, find the cost of cementing the sides and bottom of a cylindrical cistern 5 m deep and 1.5 m in diameter.

16. If a 2-cm cube of silver weighs 84 grams, what will a 6-cm cube of the same metal weigh?

17. What is the volume of the largest possible cone that can be cut from a prism 36 cm long whose base is 20 cm square?

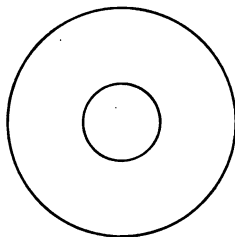
18. One of the largest pyramids of Egypt was formerly 147 m high, with a base 230 m square. How many cubic meters of masonry did it have?

19. The entire surface of a pyramid whose base is 22 cm square is 1364 sq. cm. What is its slant height?

20. What weight of mercury fills a cylindrical tank 10 cm in diameter and 20 cm deep, if the sp. gr. of mercury is 13.6?

21. A circle 30 cm in diameter has a circle 10 cm in diameter cut from its center. Find the area of the circular ring that is left.

22. At ₱.07½ per square foot, what will it cost to paint the lateral surface of 8 circular columns, each 20 in. in diameter and 18 ft. high?



23. A hollow cylinder of brass 80 cm long has an outside diameter of 50 cm and an inside diameter of 44 cm. What is the volume of the brass?

24. How many hektoliters of palay are there in a conical shaped pile whose diameter is 3 m, and whose slant height is 2.5 m? (Find the altitude first.)

25. What is the weight of a stone roller 1.2 m long and 50 cm in diameter? (Sp. gr. of stone is 2.5.)

26. How many cavaness of rice will fill a cylindrical basket that is 80 cm in diameter and 2 m high?

27. 6.75 tons of soft coal fill a bin 2.5 m long and 2 m wide. If 1 cu. m of coal weighs 750 Kg, what is the height of the bin?

28. The circumference of a circle and the perimeter of a square are each 40 cm. Find the difference between their areas.

29. Compare the surfaces of a 5-in. cube and a 5-in. sphere.

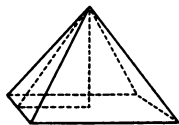
30. What will it cost to silver-plate a 2-in. sphere at ₱.50 per square inch?

31. Find the volume of a sphere that is 10 in. in diameter.

32. If the entire surface of a cube is 73.5 sq. ft., what is its volume?

33. The perimeter of an equilateral triangular pyramid is 36 cm and its slant height is 10 cm. What is the area of its base?

Its entire surface?



34. The base of a pyramid is 6 in. square. Its altitude is 4 in. What is its slant height? Its entire surface?

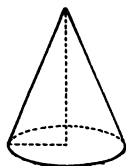
35. The slant height of a pyramid is 20 cm. Its base is 24 cm square. What is its altitude? Its volume?

36. What is the diameter of a cylindrical cistern 4 m deep that holds 7.0686 cu. m of water?

37. The volume of a cone is 3141.6 cu. in. If its altitude is 30 in., what is the diameter of its base?

38. What is the ratio of the volume of a ball 6 in. in diameter to the volume of a ball 2 in. in diameter?

39. Calculate the slant height of a cone whose altitude is 20 cm, and the diameter of whose base is 30 cm. What is its volume? Its entire surface?



GENERAL REVIEW

41. Oral.

1. At ₱ .12 $\frac{1}{2}$ each, what must I pay for 3 dozen combs?
2. I have a sheet of paper 8 cm by 12 cm, and another 4 cm by 6 cm. How do they compare in size?
3. What will 18 Kg of coffee cost at 3 Kg for ₱ 2 $\frac{1}{2}$?
4. How much change should I receive if I make a ₱ 7.26 purchase and give the salesman two ₱ 5 bills?
5. A grocer sold 25 Kg of potatoes from a box containing 75 Kg. What per cent was left?
6. The rate of taxation is 1 $\frac{3}{8}$ %. What is Alipio Concepcion's tax if he is worth ₱ 10,000?
7. How many cubic centimeters are there in a 9-cm cube?
8. $\frac{2}{3}$ % of a number is 12. What is the number?
9. How many 5-lb. packages of sugar can be made from 1750 lb. of sugar?
10. A farmer planted 3 $\frac{1}{2}$ Ha of rice and 2 $\frac{5}{8}$ Ha of maize. How many hektars did he plant?
11. I sold 300 chicos at a profit of 5 centavos on the dozen. What was my entire profit?
12. The base of a right-angled triangle is 6 cm, and the perpendicular is 8 cm. What is the hypotenuse?
13. How old is a boy to-day who was born Jan. 1, 1903?
14. I sold a horse for ₱ 80, which was 33 $\frac{1}{3}$ % advance on the cost. What was the cost?
15. What is the length of one edge of a cube whose entire surface is 2400 sq. cm?
16. In making a journey of 95 Km, I rode on the train 39 Km, in a boat 47 Km, and walked the remainder of the distance. How far did I walk?

17. If 8 books cost ₱ 6.40, what will 32 books cost at the same rate?
18. What will 40 oranges cost at ₱.36 per dozen?
19. In what time will ₱ 200 amount to ₱ 220 at 8% interest?
20. What per cent do I gain if I sell for ₱ 3 a hat which cost me ₱ 2.50?
21. What is the perimeter of a lot 12 m long which contains 288 sq. m?
22. How many days were there in Jan., Feb., and March, in 1908?
23. If $\frac{1}{4}$ of a picul of sugar costs ₱ 1.25, what will $\frac{7}{10}$ of a picul cost?
24. A square lot contains 121 sq. m. Find the cost of fencing it at ₱.40 per meter.
25. A carabao was sold for ₱ 120, which was $\frac{4}{5}$ of its cost. How much was the loss?
26. If a train goes 4 miles in 8 minutes, how far will it go in an hour at the same rate?
27. When a 2-ganta pail contains 4 liters of water, what fractional part of the pail is empty?
28. If I pay ₱.75 freight on 125 Kg of rice, how much must I pay on 1000 Kg at the same rate?
29. At ₱ 2.50 each, how many screens can be bought for ₱ 50?
30. Out of 200 pupils 20 are absent. What is the per cent of attendance?
31. At 6% a year, what is the interest on ₱ 1000 for 9 mo.?
32. Compare the volumes of two pyramids of equal altitude, their bases being 4 cm and 8 cm square respectively.
33. What will be the export duty on 8000 Kg of hemp at ₱.75 per 100 kilos?

34. What must be the length of a 2-cm board, 2 dm wide, to make 2 m, B. M.?

35. What is the rate of my commission when I receive ₱125 for selling ₱5000 worth of coal?

36. If a 12-m bolt of ribbon costs ₱1.50, what will 8 m cost at the same rate?

37. How many days are there from June 11 to July 17?

38. Eusebio is 15 years old. $\frac{2}{3}$ of his age is $\frac{5}{6}$ of Teofila's age. How old is Teofila?

39. The ratio of clear to cloudy days in a certain June was 2:3. How many of the days were cloudy?

40. A block of timber 10 dm square and 9 dm high is what decimal part of a cubic meter?

41. Name the cubes of the numbers from 1 to 10.

42. $\frac{3}{4}$ of 10 is $\frac{2}{3}$ of what number?

43. Find the entire surface of a cubical block of stone 20 cm on each edge.

44. At what rate will ₱500 produce ₱100 interest in $2\frac{1}{2}$ years?

45. If marble weighs 2400 Kg per cubic meter, what is the weight of a marble slab 25 dm by 5 dm by 1 dm?

46. At ₱250 per ton, what is the cost of 200 Kg of sulphate of copper?

47. If 6 men can do a piece of work in 5 days, how many men will be required to do it in one day? In three days?

48. How many decimeters are there in the perimeter of a triangle, each side of which is .4 m?

49. How many boxes, each holding $\frac{3}{4}$ of a liter, can be filled from 8 liters of nuts?

50. If ₱4.50 is 5% of my money, how much have I?

51. What is the weight of the water in a tank if it takes 11 minutes to empty it at the rate of 12 liters a minute?
52. What is the entire surface of a cube whose edge is $\frac{1}{2}$ ft.?
53. What is the cost of 3000 ft. of redwood lumber at ₱90 per 1000?
54. Can you gain 150 % on an article? Can you lose 150 %?
55. A boy earned ₱.80 per day and his father earned $1\frac{1}{8}$ times as much. How long did it take them both to earn ₱42?
56. On arriving in London I find my watch $2\frac{1}{2}$ hours too slow. Have I been traveling east or west? How many degrees?
57. $\frac{1}{2}$ of $\frac{4}{5}$ of a yard is 20 % of what?
58. What number increased by 12 and the sum doubled makes 34?
59. How many cubic decimeters of wood are there in a piece of timber $\frac{1}{2}$ m square and 6 m long?
60. If there were 12 rainy days in a certain November, what per cent of the days were not rainy?
61. If $16\frac{2}{3}$ % of my money is ₱450, how much money have I?
62. How is the value of a proper fraction affected by adding the same number to both terms?
63. What is the value of 75 books at ₱.75 each?
64. If a quantity of provisions will last 108 men 42 days, how long will the same last 216 men?
65. If $\frac{3}{4}$ of a hektoliter of rice is sold for $\frac{1}{2}$ of what the hektoliter cost, what per cent is lost?
66. At ₱.25 each, how many towels can I buy for ₱9.25?
67. A farmer owns 25 Ha of land, which is 20 % of what his neighbor owns. How much do they both own?
68. 24 is the antecedent and 3 is the ratio. What is the consequent?

69. In a certain school $\frac{2}{7}$ of the pupils are under 9 years of age. If there are 30 pupils over 9, how many pupils are there in the school?

70. 25 % of 20 is what per cent of 200?

Find the cost of $3\frac{1}{2}$ m of lace at ₱ $3\frac{1}{2}$ per meter.

The following is a short method of squaring a mixed number ending in $\frac{1}{2}$. Increase one factor by $\frac{1}{2}$, decrease the other by $\frac{1}{2}$, multiply, and add $\frac{1}{4}$. For example:

$$3\frac{1}{2} \times 3\frac{1}{2} = (3 \times 4) + \frac{1}{4} = 12\frac{1}{4}. \quad \text{₱ } 12\frac{1}{4} = \text{cost.}$$

$$4\frac{1}{2} \times 4\frac{1}{2} = (4 \times 5) + \frac{1}{4} = 20\frac{1}{4}. \quad 5\frac{1}{2} \times 5\frac{1}{2} = (5 \times 6) + \frac{1}{4} = 30\frac{1}{4}.$$

71. What will $2\frac{1}{2}$ m of silk cost at ₱ $2\frac{1}{2}$ per meter?

72. What will $6\frac{1}{2}$ kilos of potatoes cost at $6\frac{1}{2}$ centavos per kilo?

73. What will $7\frac{1}{2}$ liters of tuba cost at $7\frac{1}{2}$ centavos per liter?

74. What will $8\frac{1}{2}$ piculs of copra cost at ₱ $8\frac{1}{2}$ per picul?

75. Find the value of $9\frac{1}{2}$ meters of cloth at $9\frac{1}{2}$ centavos per meter.

76. How much must I pay for $10\frac{1}{2}$ lb. of sugar at ₱ $10\frac{1}{2}$ per pound?

77. At the rate of $11\frac{1}{2}$ Km per hour, how far can I ride in $11\frac{1}{2}$ hours?

78. What is $12\frac{1}{2}$ times $12\frac{1}{2}$? $20\frac{1}{2}$ times $20\frac{1}{2}$?

79. The sum of a number and a third of the number is 36. What is the number?

80. A music dealer sold an organ at $12\frac{1}{2}$ % less than cost, and lost ₱ 30. What did he receive for it? Analyze.

81. There is a bamboo pole $33\frac{1}{3}$ % under water and 18 m out of water. How long is the pole?

82. Two men are 150 Km apart and are traveling toward each other. If one travels 15 Km per day and the other 10 Km, in how many days will they meet?

REVIEW OF COMMON FRACTIONS

42. Written.

1. Define *proper fraction*, *improper fraction*, *mixed number*, *complex fraction*, *common denominator*.

2. Add: $22\frac{3}{4}$, $145\frac{2}{3}$, $92\frac{1}{4}$, $35\frac{1}{2}$.

3. From $427\frac{3}{4}$ take $298\frac{5}{8}$.

4. Multiply $225\frac{4}{7}$ by $77\frac{3}{8}$; $1008\frac{8}{11}$ by $35\frac{3}{4}$.

5. Multiply $22\frac{1}{3}$ by $33\frac{2}{5}$ by $37\frac{1}{2}$; $10\frac{8}{9}$ by $10\frac{8}{9}$ by $11\frac{4}{7}$.

6. Divide $475\frac{5}{8}$ by $13\frac{1}{3}$; $1093\frac{1}{8}$ by $32\frac{3}{4}$.

7. Divide $31\frac{1}{4} \times 43\frac{1}{5}$ by $7\frac{1}{6} \times 14\frac{7}{12}$.

8. Simplify: $2\frac{1}{3} \times 3\frac{3}{4} \times 6\frac{2}{7} + 1\frac{3}{8}$.

9. Simplify: $\frac{\frac{7}{8} \times 2\frac{3}{4} \times 2\frac{4}{7}}{22\frac{1}{2} + 14\frac{2}{3}}$; $\frac{\frac{2}{3} \text{ of } \frac{9}{10} \text{ of } \frac{5}{11} \text{ of } 3\frac{1}{2}}{\frac{3}{11} \times 4\frac{2}{3} + \frac{4}{5}}$.

10. $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{2}{5}$ of a number added together equal 111. What is the number?

11. $\frac{1}{5}$ of a number less $\frac{1}{8}$ of it is 6. What is the number?

12. What part of $4\frac{1}{2}$ is $3\frac{1}{3}$? Of $4\frac{3}{4}$ is $3\frac{5}{8}$? Of $6\frac{1}{2}$ is $4\frac{3}{5}$?

13. What part of $\frac{3}{4}$ is $\frac{5}{8}$? Of $\frac{9}{10}$ is $\frac{2}{3}$? Of $\frac{5}{6}$ is $\frac{2}{3}$?

14. Find the number of which 275 is $\frac{5}{8}$; 217 is $\frac{7}{9}$; 415 is $\frac{5}{11}$.

15. If $3\frac{1}{2}$ piculs of copra cost ₦20, what will $8\frac{3}{4}$ piculs cost?

16. If $\frac{5}{7}$ of a farm is worth ₦25,500, what is $\frac{2}{3}$ of it worth?

17. A man paid ₦120 for a horse and a cow. If the cow cost $\frac{2}{3}$ as much as the horse, what did he pay for each?

18. What is the value of 500 eggs at ₦.32 per dozen?

19. A merchant bought 250 m of silk at ₦1 $\frac{1}{2}$ per meter, and sold $\frac{7}{10}$ of it at ₦2 per meter. For how much a meter must he sell the remainder that his total profit may be ₦115?

20. Find the prime factors of 1140; of 2310.
21. Find the greatest common divisor of 2310 and 1995.
22. Find the least common multiple of 14, 15, 24, 25, 28, 21.
23. Simplify: $\frac{\frac{3}{8}}{\frac{2}{5} \text{ of } \frac{5}{8}} \div \frac{\frac{1}{3} \text{ of } \frac{6}{7}}{3\frac{1}{7}} \cdot \frac{\frac{4}{5} + \frac{3}{10}}{\frac{2}{5} + \frac{9}{10}} + 2\frac{1}{2}$.
24. A can do a piece of work in 12 days. A and B can do it in 8 days. How long will it take B alone to do the work?
25. If I pay ₦42 $\frac{1}{2}$ for 3 $\frac{1}{3}$ tons of coal, how much must I pay for 5 $\frac{3}{5}$ tons? Analyze.
26. A and B did a piece of work for ₦40. A worked 10 days and B 6 days. What was the share of each?
27. A and B can do a piece of work in 12 days, B and C in 8 days, and A and C in 6 days. How long will it take all three to do it working together?
28. A farmer exchanged 6 $\frac{1}{4}$ Hl of rice at ₦6 $\frac{2}{5}$ per hektoliter for maize worth ₦2 $\frac{3}{5}$ per hektoliter. How much maize did he get? Analyze.
29. A tailor cut off $\frac{1}{3}$ of a piece of cloth and then $\frac{5}{12}$ of the remainder, and found that he had 5 $\frac{3}{5}$ m left. How much was in the piece at first?
30. A man invested $\frac{1}{3}$ of his money in a farm, $\frac{2}{5}$ of what remained in a house, and $\frac{3}{8}$ of what then remained in furniture. What part of his money had he left?
31. A can do a piece of work in $\frac{1}{2}$ of a day, B in $\frac{1}{3}$ of a day, and C in $\frac{1}{4}$ of a day. In what time can they do it together?
32. What will $\frac{2}{3}$ of $\frac{3}{5}$ of a pound of tea cost, if $\frac{5}{6}$ of $\frac{9}{10}$ of a pound costs ₦ $\frac{9}{10}$?
33. What is the value of $(3\frac{1}{4} - 2\frac{1}{2} + 4\frac{1}{8} - 2\frac{3}{8}) \div 5\frac{3}{8}$?
34. A can do a piece of work in 2 $\frac{3}{5}$ days and B can do it in 2 $\frac{2}{5}$ days. How long will it take them to do it working together?

REVIEW OF DECIMAL FRACTIONS

43. Written.

1. Add: 125.05, 18.204, 1.0095, .00075, and 350.2.
2. From $428.75 + 140.45$ subtract 285.01695.
3. Multiply 2008.15 by .0124; 800.24 by .012 $\frac{1}{2}$.
4. Divide 150 by .0125; 3.72812 by 8.14.
5. Divide ₱ 68.87 $\frac{1}{2}$ by ₱ 290; ₱ 528 by ₱ .37 $\frac{1}{2}$.
6. Find the value of $\frac{.0021 \times 1.505}{.049}$.
7. What is the cost of 5250 coconuts at ₱ 32.40 per 1000?
8. At ₱ .37 $\frac{1}{2}$ each, how many chickens can I buy for ₱ 84?
9. If 8.4 Hl of coconut oil cost ₱ 357, how many hektoliters can I buy for ₱ 221?
10. How many meters of sinamay at ₱ .12 $\frac{1}{2}$ a meter will 15 dozen eggs pay for at ₱ 2.50 per hundred?
11. How many days must a laborer work at ₱ .85 per day to pay for 4.25 cu. m of wood at ₱ 3.25 per cubic meter?
12. If I sell .22 of my tobacco at one time, and .43 of it at another time, and have 77.7 Kg left, how many kilos had I at first?
13. How many times will a wheel 3.25 m in circumference turn in going 3.9 Km?
14. Reduce $\frac{2\frac{1}{2}}{12\frac{1}{2}} \div \frac{2\frac{1}{4}}{4\frac{1}{2}} \times \frac{3}{5} + .05$ to a decimal.
15. What is the value of $\frac{2.5 - .7}{3} + \frac{3.3 - .8}{5} + 19.2$?
16. If 12 men can do a piece of work in 6.25 days, how many men will it take to do it in 3 days?
17. At the rate of 2.2 m of piña for ₱ 2.75, how many meters can be bought for ₱ 9.75?
18. $2.25 \times 1.6 \times .07 \div (2.8 \times 3.6) = ?$

REVIEW OF METRIC MEASURES

44. Written.

1. One kilogram equals 2.2046 lb. How many pounds are there in 2.5 metric tons?

2. How many kilograms are there in 1653.45 lb.?

3. How many hektoliters of water will a tank hold that is 1 m long, 80 cm wide, and 75 cm deep?

4. What is the entire surface of the inside of the tank in No. 3?

5. Find the cost of digging a canal 600 m long, 1.8 m wide, and 1.25 m deep at ₱.55 per cubic meter.

6. What is the specific gravity of lead if a 5-cm cube of it weighs 1425 g?

7. A mile is 1.60935 Km. A kilometer is what decimal part of a mile?

8. At ₱.16 per meter, what will it cost to fence a square field whose area is 2.25 Ha?

9. What is the price per cubic meter, if I pay ₱52.80 for a pile of wood 6.4 m long, 1.2 m wide, and 2.5 m high?

10. Find the cost of painting the walls and ceiling of a room 4.8 m long, 2.5 m wide, and 3 m high, at ₱.35 per square meter.

11. How many meters, B.M., are there in 25 beams 12 cm by 25 cm and 7.2 m long?

12. Allowing 750 bricks to the cubic meter, and 22 cu. m for openings, what will it cost to build the walls of a brick house 8 m. long and 7.8 m wide, if the walls are 6.5 m high and .4 m thick, and ₱22.50 per 1000 is paid for the bricks and ₱4.50 per 1000 is paid for laying them?

13. What is the specific gravity of oak if a block of it 40 cm long, 25 cm wide, and 22 cm thick weighs 20.9 Kg?

REVIEW OF PERCENTAGE

45. Written.

1. What is $137\frac{1}{2}\%$ of 888? $\frac{7}{8}\%$ of 2420?
2. What per cent of $12\frac{1}{4}$ is $1\frac{3}{4}$? Of 24 is $4\frac{1}{8}$?
3. $\frac{3}{4}$ is 12 % of what number?
4. $2\frac{1}{8}$ is $\frac{2}{5}\%$ of what number?
5. 451 is $2\frac{1}{2}\%$ more than what number?
6. 397 is $\frac{3}{4}\%$ less than what number?
7. What per cent of a number is $\frac{3}{7}$ of it? $\frac{4}{11}$ of it? $\frac{1}{15}$ of it? $\frac{3}{400}$ of it?
8. A man sold for ₱.44 per liter, coconut oil that cost him ₱38 per hektoliter. What was his gain per cent?
9. A merchant sold 40 shirts for ₱84 and gained 20 %. What did the shirts cost per dozen?
10. If 24 % is gained on a chair sold for ₱.60 above cost, what do such chairs cost per dozen?
11. What is the commission at $2\frac{3}{4}\%$ on ₱2240?
12. An agent received ₱45.90 for selling 850 sacks of flour at ₱2.40 per sack. What was the rate of his commission?
13. An agent collected a certain debt. After taking out his commission of $2\frac{1}{2}\%$, he remitted ₱633.75. What was the amount of the debt?
14. What single rate of discount is equivalent to 25 %, 20 %, and 10 % off?
15. A dealer got a discount of 20 %, 15 %, and 10 % on an automobile listed at ₱850. For how much must he sell it in order to gain 25 %?
16. What was the list price of a carriage bought for ₱259.20 if the discounts were 20 %, 10 %, and 10 %?

17. What is the tax on property assessed at ₱24,450 if the tax rate is $1\frac{1}{8}\%$?

18. What is the rate of taxation, if a farmer pays ₱78 on 240 Ha of land assessed at ₱65 per hektar?

19. If a man's tax on 360 Ha of land at $\frac{3}{4}\%$ is ₱148.50, what is the assessed value of his land per hektar?

20. Find the total duty on 6 phonographs costing ₱42.50 each, duty 30%; 12 sewing machines costing ₱45 each, duty 15%; and 10 typewriters costing ₱87.50 each, duty 15%.

21. A dealer paid ₱525 duty on 24 bicycles at the rate of 25%. What was the cost of each bicycle?

22. If it costs ₱57.60 to insure a house worth ₱6400 for $\frac{3}{4}$ of its value, what is the rate of insurance?

23. I insured my house for $\frac{5}{8}$ of its value at $1\frac{1}{2}\%$, paying a premium of ₱45.75. What was the value of the house?

24. At ₱27.88 per ₱1000, what will a man pay in premiums in 15 years if he is insured for ₱5000?

25. In what time will ₱480 amount to ₱574.80 at 9%?

26. At what rate will ₱2400 yield ₱440 interest in 2 yr. 5 mo. 10 da.?

27. What principal will yield ₱102.50 in 3 yr. 5 mo. at 8%?

28. Find the exact interest on ₱640 from July 1 to Sept. 12 of the same year at $8\frac{1}{2}\%$.

29. A note for ₱840, dated Feb. 1, 1908, was indorsed as follows: March 16, ₱180; June 16, ₱240; Sept. 1, ₱100; Oct. 16, ₱200. How much was due Dec. 16, 1908, with interest at 9%?

30. A 60-day note for ₱500, without interest, dated June 1, 1908, was discounted at a bank July 1, at 10%. Find the proceeds.

21. Find the compound interest on ₱1500 for 1 yr. 9 mo. at 8%, interest compounded semi-annually.
22. Write a note for ₱500.25, dated July 10, 1908, due in 10 months, with interest at 9%; maker, yourself; payee, C. M. Santos. Find the amount due at maturity.
23. If I deposit ₱800 in the Postal Savings Bank July 1, 1908, and draw out ₱300 July 1, 1909, what will be due me July 1, 1911? (Compound interest at $2\frac{1}{2}\%$.)
24. What will be the cost of 64 100-peso shares of railroad stock at $5\frac{3}{8}\%$ premium, brokerage $\frac{1}{8}\%$?
25. What will be my income if I invest ₱8392.50 in 5% stocks at 93, brokerage $\frac{1}{4}\%$?
26. What is my gain per cent if I buy stock at $12\frac{1}{2}\%$ discount and sell it at $12\frac{1}{2}\%$ premium?
27. If 5% stock is bought at 20% discount, what is the rate of interest received on the investment?
28. What annual income is received from ₱29,000 invested in $5\frac{1}{2}\%$ stock which cost 72 $\frac{3}{8}$, brokerage $\frac{1}{8}\%$? What is the rate of interest received on the investment?
29. What must be invested in 5% stock at 92 $\frac{1}{4}$, brokerage $\frac{1}{4}\%$, to yield an annual income of ₱1100?
40. A invested ₱11,400 in 5% stock at 95. B loaned an equal amount of money at 5%. How much greater is A's annual income than B's?
41. A man received an annual income of ₱2120 from ₱32,012 invested in stock at 75 $\frac{1}{2}$. How many shares had he? What rate of interest did he receive on his investment? What dividend did the stock pay?
42. If stock bought at 15% premium pays 8% on the investment, what per cent would it pay if bought at 15% discount?

REVIEW OF RATIO AND PROPORTION

46. Written.

1. $2\frac{1}{2} : 4\frac{1}{2} = ?$ $.42 : 6.3 = ? : 10.5$.
2. Separate 380 into two parts having the ratio of 7 to 18.
3. If 25 piculs of hemp cost ₱362.50, how many piculs can I buy for ₱464?
4. If 8 men can do a piece of work in 25 days, how long will it take 15 men to do it?
5. A block of wood 80 cm long, 60 cm wide, and 25 cm thick weighs 108 Kg. What is the volume of a block of the same kind of wood that weighs 13.5 Kg?
6. If ₱2400 yields ₱432 interest in 2 yr. 3 mo., in what time will the same principal yield ₱608 interest?
7. A, B, and C earned together ₱735. A earned twice as much as B, and B earned twice as much as C. How much did each earn?
8. If 15 men working 14 days of 10 hours each can dig a ditch 1000 m long, 1.5 m wide, and .7 m deep, what length of ditch 2 m wide and .5 m deep can 10 men dig in 25 days working 8 hours a day?
9. The ratio of two numbers is $\frac{1}{4}$. $\frac{2}{5}$ of their sum is 64. What are the numbers?
10. Divide 20.5 into two parts having the ratio of $1\frac{2}{3}$ to $2\frac{1}{2}$.
11. A, B, and C formed a partnership. A put in ₱5000 for 8 months, B ₱7000 for 5 months, and C ₱5000 for 5 months. They gained ₱3560. What was each partner's share?
12. Feb. 1, A, B, and C entered into partnership for one year. A put in ₱4000, B ₱6000, and C ₱5000. Aug. 1, A added ₱4000 and B took out ₱2000. If their profits for the year were ₱3840, what was each partner's share?

REVIEW OF SURFACES AND VOLUMES

47. Written.

1. The volume of a prism is 360 cu. cm. Its base is 6 cm square. What is its height? Its entire surface?

2. Find the volume and entire surface of a cylinder 20 cm in diameter and 20 cm high.

3. What is the volume of a pyramid whose base is 10 in. square and whose altitude is 12 in.?

4. Find the slant height and entire surface of the pyramid in No. 3.

5. The volume of a cone is 261.8 cu. cm, and the diameter of its base is 10 cm. What is its altitude?

6. Find the slant height and the lateral surface of the cone in No. 5.

7. How many lead balls 2 cm in diameter will weigh as much as a lead ball 8 cm in diameter?

8. At ₱15 per cubic meter, what will a log cost that is 8 m long and whose average circumference is 120 cm?

9. What will it cost to gild a globe 60 cm in diameter at ₱.005 per square centimeter?

10. What will it cost to paint the entire surface of a cone whose slant height is 5 m and the diameter of whose base is 6 m, at ₱.90 per square meter?

11. Find the altitude and the volume of the cone in No. 10.

12. At ₱.22 per square meter, find the cost of the sawali necessary for the four walls and the ceiling of a room 6 m long, 4.5 m wide, and 3 m high, allowing $14\frac{1}{2}$ sq. m for openings.

13. If the earth were a perfect sphere 8000 miles in diameter, what would be the area of its surface?

14. Find the weight of a lead cone whose base is 3 cm in diameter and whose altitude is 3 cm. (Sp. gr. of lead is 11.34.)

15. A solid silver ball 4 cm in diameter weighs 352.8645 g. What is the specific gravity of silver?

16. How many hektoliters of palay are there in a conical shaped pile whose circumference is 12.5664 m and whose altitude is 1.5 m?

17. What weight of mercury (sp. gr. 13.6) will a can hold that is 10 cm in diameter and 15 cm high?

18. What is the weight of a hollow sphere of brass (sp. gr. 8.5) whose inside diameter is 8 cm and whose outside diameter is 10 cm?

19. What must be the depth of a cylindrical tank 50 cm in diameter that it may hold 196.35 liters of water?

20. Find the square root of 19,740.25. Of .00069169.

21. The two perpendicular sides of a right-angled triangle are each 120 m. Find its perimeter.

22. A circular pond 10 m in diameter has a walk 1 m wide around it. How many square meters are there in the walk?

23. What is the area of an equilateral triangle measuring 10 in. on each side?

24. Find the circumference of a circle whose area is 7.0686 sq. m.

25. Two trains start from the same place, one going north at the rate of 36 Km per hour, and the other east at the rate of 30 Km per hour. How far apart are they in 4 hours?

26. Find the edge of a cube whose entire surface is 486 sq. in.

27. Find the square root of 24,611,521. Of 32,239684.

28. The volume of a cube is 512 cu. in. Find its entire surface. Its diagonal.

MISCELLANEOUS PROBLEMS

48. Written.

1. The product of three numbers is 1008. Two of the numbers are 4 and 7. What is the third number?

2. From a tank containing $120\frac{3}{4}$ l of coconut oil, $6\frac{7}{10}$ l leaked out. What part of the oil remained? What was the remainder worth at ₦.30 per liter?

3. Make six different numbers with the figures 6, 4, and 8, and add the numbers.

4. Find the interest on ₦340 for 3 yr. 6 mo. at 5%.

5. How many gantas of coffee at ₦1.50 per ganta can I get in exchange for 40 Kg of copra at ₦.12 $\frac{1}{2}$ per kilo?

6. A boy sold a bicycle at a gain of $22\frac{1}{2}$ %. What did he receive for it if it cost him ₦25.20?

7. The import duty on grain and flour is reckoned per 100 Kg. Find the import duty on 2560 Kg of wheat, in grain, at ₦.50; 800 Kg of rye, in flour, at ₦.80; 1250 Kg of maize, in grain, at ₦.20; 1620 Kg of barley, in grain, at ₦.50; and 1750 Kg of oats, in grain, at ₦.20.

8. If a mass of lead and zinc weighing $16\frac{3}{4}$ Kg contains $4\frac{1}{10}$ Kg of lead, what part of the mass is zinc?

9. The Siberian railroad carried 1,280,000 passengers in 1903, 1,757,800 in 1904, and 1,846,300 in 1905. Find the total number carried in these three years.

10. Find the amount of a note for ₦2500, dated March 15, 1902, due Jan. 3, 1904, with interest at 6%.

11. Find the duty on the following importations: 250 Kg of wall paper at ₦4 per 100 Kg; 50 Kg of sand paper at ₦3.50 per 100 Kg; 45 Kg of carbon paper at ₦.40 per Kg; and 32 Kg of pasteboard boxes at ₦.20 per Kg.

12. For use in a chemical laboratory, 5 Kg of nickel were imported at ₱4.20 per Kg, duty ₱8 per 100 Kg; 7 Kg of tin at ₱2.95 per Kg, duty ₱4 per 100 Kg; $\frac{3}{4}$ Kg of silver, at ₱59 per Kg, no duty; 12 Kg of glass tubing at ₱.85 per Kg, duty ₱4.50 per 100 Kg; and 20 l of nitric acid (sp. gr. 1.4) at ₱.35 per Kg, duty ₱.50 per 100 Kg. Find the entire cost of these purchases.

13. Find the cost of shipping 359.8 tons of rubber from Colombo, Ceylon, to New York City, United States, at \$12 a ton, and 450.6 tons of tea at \$8 a ton.

14. What number must be subtracted from $\frac{1}{4}$ to leave .04?

15. A school having 275 pupils graduated 33. What per cent were graduated?

16. If $12\frac{1}{2}\%$ of a number is 53, what is 32 times the number?

17. If Luzon in one year produced 25,023,570 Kg of hemp, and this was $\frac{3}{8}$ of the total amount produced in the Philippines, what was the total crop?

18. What must I pay for the bricks to lay a pavement 20 m long and $1\frac{3}{4}$ m wide, if it takes 75 bricks to the square meter, and they cost ₱40 per 1000?

19. A dealer bought 3000 men's collars at ₱3 a dozen, and sold them at ₱.35 each. What per cent did he gain? How much did he gain on the whole number?

20. If a man worked for ₱1.50 per day, spent 80% of his income for living expenses, and saved ₱75 in a year, how many days did he work?

21. In one year Cagayan province produced 2,663,296 Kg of tobacco classified as follows: 1.2% of first class, 3.1% of second class, 6.5% of third class, 11.7% of fourth superior class, 31.1% of fourth ordinary class, and 46.4% of fifth class. Find the number of kilos of each class.

22. An agent bought 25 sewing machines listed at ₱ 60 each at a discount of 25 % and 10 %, and sold them at 10 % advance on the list price. Find his gain.

23. If a man can build a fence in 32 days working 6 hours a day, in how many days could he build it working 8 hours a day?

24. A man sold an automobile for ₱475, which was $16\frac{2}{3}$ % less than it cost. How much did it cost?

25. At ₱3 per square meter, what will it cost to pave with asphalt a street .7 Km long and 10.2 m wide?

26. A merchant bought ₱2365.20 worth of linen and marked it to sell at $33\frac{1}{3}$ % above cost. He sold half of it at the marked price and the other half at 10 % off the marked price. How much did he gain?

27. In Samar, 23,641,792 Kg of sweet potatoes were produced on 2351 Ha of land; in Cagayan, 5,415,626 Kg on 657 Ha; and in Surigao, 4,127,434 Kg on 3014 Ha. What was the average number of kilos per hektar in these three provinces taken together?

28. If a dressmaker charges her customer ₱52.50 for $12\frac{1}{2}$ m of lace which cost her ₱3.50 per meter, what is her per cent of profit?

29. What will be the value of the cacao produced by 11,680 trees, averaging 1.25 Kg each, at ₱.92 per kilo?

30. A lawyer collected $82\frac{1}{2}$ % of a bill of ₱3200 and charged $5\frac{1}{2}$ % commission. How much did he remit to his client?

31. In 1906, the Philippine Islands exported to the United States 235,854 cigars, which was $\frac{1}{4}$ % of the total number exported. How many were exported that year?

32. A dealer sold pencils at ₱.05 each, which gave him a profit of ₱1.75 on the hundred. How much did they cost him per dozen?

33. If I import 9 carriages valued at ₱450 each, pay 20% ad valorem duty on them, and sell them at a profit of 30% on the whole cost, what will I gain on all?

34. How many $2\frac{1}{2}$ l bottles will be needed to hold 74 Kg of sulphuric acid? (Sp. gr. 1.85)

35. In a certain year 524,767 acres in India were planted in tea, which averaged 365 pounds per acre. If 4% of the crop was sold to Australia, how many pounds did Australia purchase?

36. The roof of a house 35 ft. long and 24 ft. wide consists of two rectangles, and the ridge is 9 ft. above the base of the gable. What is the weight of the corrugated iron roofing required to cover this roof, if it weighs 75 pounds to the 100 sq. ft.?

37. When it is 6 p.m. in Greenwich, it is 49 min. 56 sec. past 6 p.m. in Rome, and 9 min. 33 sec. past noon in Chicago. What is the difference in longitude between Rome and Chicago?

38. The Philippines exported dyewoods in 1902 valued at ₱40,936. If this was $\frac{7}{100}$ % of the total value of the exports, find the total exports.

39. A Manila grocer purchased 2000 Kg of flour at ₱.11 $\frac{1}{4}$ per Kg; 130 Kg of tea at ₱1.50 per Kg; 70 Kg of baking powder at ₱1.75 per Kg; 230 Kg of corn meal at ₱.30 per Kg; 500 Kg of potatoes at ₱.08 per Kg; and 50 Kg of cheese at ₱1.10 per Kg. If the corn meal becomes moldy and therefore worthless, at what per cent advance must he mark the remainder of the articles purchased so that he may gain 10% on the whole lot?

40. Find the weight of the sand (sp. gr. 1.5) that fills a box 2 m by 1.4 m by .3 m.

41. What is the difference in time between Shanghai, 121° 29' E. and Naples, 14° 15' 30'' E.?

42. A boy is offered ₱7.50 a week the first year for clerking in a store, $33\frac{1}{3}\%$ more the second year than the first, and 25% more the third year than the second. What will be his total salary for the three years, allowing 52 weeks to the year? What will his salary average per week for the whole time?

43. During 1906, Hongkong imported 483,120 tons of sugar, of which 72,468 tons came from the Philippines. What per cent did the Philippines supply?

44. In what time will ₱600 double itself at 6% ?

45. A wine merchant imported 42 liters of alcohol, duty ₱1.40 per liter; 320 liters of fine wines, duty ₱.50 per liter; 260 liters of common wines, duty ₱.20 per liter; and 300 liters of ginger ale, duty ₱3 per hektoliter. Find the total duty paid.

46. If a bar of iron 1.5 cm square and 2 m long weighs 3.51 Kg, what is the weight of a bar 2.5 cm square and 8 m long?

47. A 4-months' note for ₱1129, dated April 9, with interest at 6% , was discounted at a bank May 6, at 5% . Find the proceeds.

48. I sold a carriage to A and gained $7\frac{1}{2}\%$. A sold it to B for ₱283.80 and lost 12% . What did the carriage cost me?

49. A square lot measuring 37.5 m on each side is inclosed by four lines of wire. 16 m of this wire weigh a kilo and the wire cost ₱.26 per kilo. What did the wire for the fence cost?

50. If I lose 5% by selling an article for ₱8.93, for how much must I sell it to gain 5% ?

51. A contractor finds that it will take 8 men 12 weeks to do a piece of work. If he wishes to have the work completed in 9 days, how many men must he employ?

52. How many kilos of hemp at ₱ $\frac{9}{40}$ per kilo will pay for $120\frac{2}{3}$ kilos of tobacco at ₱ $\frac{1}{8}$ per kilo?

53. A grocer purchased 24 2-lb. tins of corned beef for ₱14.50. If one can out of every six was found to be unsalable, at what price must he sell each of the good cans to gain 20% on the whole lot?

54. A carpenter worked 250 days in one year at ₱2.50 per day. The next year his daily wages were increased 10% and the number of working days was decreased 10%. What change was made in his annual income?

55. Find the weight of the oil that fills a cylindrical tank 2 m in diameter and 1.9 m deep, if the sp. gr. of the oil is .95.

56. If a pipe 4 cm in diameter fills a cistern in 3 hours, how long will it take a pipe 6 cm in diameter to fill it?

57. During 10 months of one year, 493,179 bales of hemp were received in Manila; and during the corresponding 10 months of the next year, 657,572 bales. What was the per cent of increase? What were the average monthly receipts?

58. Find the entire surface of a cube whose edge is 4.2 m.

59. If a train runs 48 Km per hour, what is its average rate of speed per second?

60. Find the compound interest on ₱1250 for 3 yr. at 8%.

61. How much silk .6 m wide will it take to line 5.4 m of broadcloth 1.3 m wide?

62. An agent sold hemp for ₱875 on a commission of 4%. He invested the net proceeds in sugar at ₱4 per picul, reserving his commission of 5%. How many piculs of sugar did he buy? What was his entire commission?

63. If 8 men spend ₱640 in 15 weeks, how much will 15 men spend in a year at the same rate?

64. What is the volume and entire surface of a cube whose edge is $10\frac{1}{2}$ in.?

65. For use in the study of volumes, the carpentry class made 2 rectangular prisms 12 cm by 6 cm by 25 cm, a cylinder 10 cm in diameter and 18 cm high, and two 6-cm cubes. If these solids were all cut from a block of wood 25 cm by 22 cm by 12 cm, how many cubic centimeters were wasted?

66. Find the entire surface of a rectangular solid 31.1 cm long, 22.2 cm wide, and 10.5 cm high.

67. If a merchant's profit is 30 % of his sales, what is his actual rate of profit?

68. Find the weight of a bar of lead .7 m by .15 m by .03 m, whose sp. gr. is 11.38.

69. Find the inner and outer circumferences of a walk 2.5 m wide running around a circular grass plot 32 m in diameter.

70. Find the area of the walk in No. 69.

71. A block of granite is 8 m long and $1\frac{1}{2}$ m square at the ends. How many cubic meters must be cut away to leave the largest possible cylindrical column?

72. If A lends B ₱ 600 for 4 months, how long ought B to lend A ₱ 1600 to balance the favor?

73. If 10 men working 5 hours a day for 12 days can build a fence 400 m long, how many men working 10 hours a day for 11 days will it take to build 220 m of the same kind of fence?

74. What is the time of day when the time past noon equals the time to midnight? When one half the time past noon equals one fourth the time to midnight?

75. A liveryman borrowed ₱ 90 for 1 yr. at 6 % interest. With this money he immediately bought a horse which earned for him ₱ 1 per day. The expense of keeping the horse per day was ₱ .30. At the end of the year he sold the horse for ₱ 70. How much did he gain if the horse worked 312 days during the year?

49. Written.

$$1. \frac{3}{2} + (\frac{3}{4} \times \frac{2}{3} \div \frac{4}{5}) - (\frac{1}{8} \div \frac{1}{10}) - (\frac{3}{4} \times \frac{1}{3}) = ?$$

$$2. .0625 \div .125 \times .0648 \div 7.2 = ?$$

$$3. \text{Simplify: } \frac{2\frac{1}{2} \times 4\frac{2}{3}}{3\frac{3}{4} \times 2\frac{2}{3}} + 6\frac{2}{3}.$$

$$4. \text{What per cent of a number is } \frac{1}{3} + \frac{2}{3} \text{ of it?}$$

$$5. \text{What fractional part of } \frac{1}{10} \text{ of a peso is } 2\frac{3}{4} \text{ centavos?}$$

$$6. \text{What fractional part of } 31\frac{2}{5} \text{ is } 12\frac{4}{5}?$$

7. 45 % of the length of a pole is in the air, 35 % of it is in the water, and the remainder, 4.8 m, is in the mud. What is the length of the pole?

8. When a pole 40 m high casts a shadow 75 m long, how long a shadow will be cast by a tree 15 m high?

9. At ₱4.25 per cubic meter, what will a pile of wood cost that is 6.4 m long, 1.2 m wide, and 2.5 m high?

10. Find the area of a trapezoid whose parallel sides measure 7.5 m and 12.5 m, the perpendicular distance between them being 8.4 m.

11. A boy bought oranges at the rate of 2 for 1 centavo and sold them at the rate of 3 for 2 centavos, thus gaining 30 centavos. How many oranges did he buy?

12. A man sold two carabaos for ₱99 each. On one he gained 10 %, and on the other he lost 10 %. Did he gain or lose by the two transactions, and how much?

13. What single discount is 25 % and 25 % equal to?

14. At ₱3.25 per square meter, what is the cost of concreting the bottom and sides of a cylindrical cistern 2 m in diameter and 8 m deep?

15. Find the entire surface of a block of wood 32.2 cm long, 21.1 cm wide, and 12.5 cm thick.

16. The hind wheel of a carriage is 1 m high and the fore wheel is .8 m high. How many revolutions will the fore wheel make while the hind wheel is making 840?

17. A note for ₱1200, with interest at 8 %, is dated July 10, 1907. Payments are made as follows: Oct. 10, 1907, ₱300; Jan. 25, 1908, ₱360; May 25, 1908, ₱240. Find the amount due July 25, 1908.

18. Divide ₱101 into two parts having the ratio of $\frac{3}{4}$ to 1.

19. I sold goods at ₱1575, losing $6\frac{1}{4}$ %. Find the cost.

20. At $1\frac{3}{8}$ %, my tax was ₱47.60. What was the value of my property?

21. Find the interest on ₱240.50 for 2 yr. 7 mo. at 12 %.

22. In what time will ₱3200 yield ₱198.40 interest at 8 %?

23. What principal will yield ₱2.56 in 1 mo. 10 da. at 10 %?

24. At what rate will ₱1920 yield ₱33.60 in 4 mo. 6 da.?

25. In what time will ₱49.50 amount to ₱52.79 at 4 %?

26. Find the compound interest on ₱2000 for 4 yr. at 6 %.

27. Find the exact interest on ₱1080 from July 1 to Oct. 1 at 6 %.

$$28. \frac{20\frac{1}{3} \times \frac{3}{4}}{142 \times \frac{3}{71} \times \frac{1}{2}} = ? \quad \frac{2\frac{1}{2} + 3\frac{1}{2}}{7\frac{1}{3} \div \frac{3}{4} \times \frac{1}{2}} = ?$$

29. Multiply 4 hr. 25 min. 37 sec. by 35.

30. Divide $250^{\circ} 49' 30''$ by 15.

31. A dealer sold a hat for ₱4.50 and gained 25 %. What per cent would he have gained had he sold it for ₱4.20?

32. Find the G. C. F. of 2970, 3150, and 5850.

33. Find the L. C. M. of 24, 32, 48, 64, and 80.

34. A farmer sold 25 carabaos at ₱112 a head, and with the money he bought a piece of land 620 m by 600 m. He had ₱10 left. What was the cost of the land per hektar?

35. A dealer marked a carriage 25 % above cost. He sold it for ₦375, which was at a discount of 25 % from the marked price. What did the carriage cost?

36. A grocer paid ₦.90 per kilo for coffee, which he roasted, thus losing 10 % of its weight. At what price per kilo must he sell the roasted coffee in order to gain 15 %?

37. If atmospheric pressure is 15 lb. to 1 sq. in., find the pressure on the top of a round table 30 in. in diameter.

38. ₦1850 is divided among three men, A, B, and C, so that A gets $\frac{2}{3}$ as much as B, and B gets $\frac{3}{4}$ as much as C. What is the share of each?

39. The hind wheel of a victoria is 1.35 m high and revolves 900 times in going a certain distance. If the fore wheel is 1.05 m high, how many times does it revolve in going the same distance?

40. If the rainfall on a certain day was $1\frac{1}{2}$ cm, how many tons of water fell on 8.2 Ha of land?

41. A, B, and C formed a partnership for one year, each putting in ₦3500. At the end of six months A put in ₦1000 more, and C drew out ₦1000. If they gained during the year ₦3780, what was each partner's share of the gain?

42. A bin 1.8 m wide and 1.5 m high holds 90 cavanese of rice. How long is it?

43. An iron cylinder 10 cm in diameter and 15 cm long weighs 9.18918 Kg. What is the specific gravity of the iron?

44. The weight of alcohol (sp. gr. .81) that fills a cubical tank is 414.72 Kg. What is the size of the tank?

45. A ladder 20 m long just reaches a window 16 m high. How far is the foot of the ladder from the building?

46. The slant height of a square pyramid is 15 cm, and one side of its base is 24 cm. Find its volume.
47. The perimeter of a square park and the circumference of a circular park are each 94.248 m. Find their difference in area.
48. What is the present worth of a debt of ₱1417.50 due in 6 mo., if money is worth 10 %?
49. What was the list price of a piano, if with discounts of 10 % and 10 % I bought it for ₱810?
50. A note for ₱1000, dated July 20, 1908, due in 4 mo., with interest at 9 %, is discounted at a bank Sept. 16, at 8 %. Find the proceeds.
51. A horse trader sold 20 horses for ₱1650, at a gain of 10 %. What should have been his average price per head to gain 20 %?
52. Find the cost of 90 joists, each 15 in. wide, 3 in. thick, and 24 ft. long, at ₱90 per 1000 feet, B. M.
53. If 4 men do as much work as 9 boys, how long will it take 27 boys to do as much work as 10 men can do in 12 days?
54. If I bought stock at 10 % discount, and sold it at 10 % premium, thus gaining ₱840, how much money did I invest?
55. Find the true discount of a debt of ₱810 due in 10 mo. 20 da., at 9 %.
56. If a newsboy buys papers at ₱.33 a dozen and sells them at 5 centavos each, what is his gain per cent?
57. What is the area of an equilateral triangle whose perimeter is 120 cm?
58. Which is better and how much, to buy 6 % bonds at 72 or 9 % bonds at $112\frac{1}{2}$?
59. What is the edge of a cube of lead (sp. gr. 11.4) that weighs 1425 g?

60. Find the square root of 13.3225. Of 324.396121.
61. A man bought 400 cavanese of rice at ₱ 4.25 a cavan, and sold it at ₱ 4.75 a cavan, on a 60-day note. If he discounted the note immediately at a bank at 8 %, how much did he gain?
62. The hypotenuse of a right-angled triangle is 35 cm and its perpendicular is 22 cm. What is its base?
63. At ₱ 3.20 per square meter, it will cost ₱ 313.60 to pave with concrete a court whose length is double its width. Find the length of the court.
64. I bought a bill of hardware amounting to ₱ 6240 on 6 months' credit, but was offered a discount of 6 % for cash. How much would I have gained by paying cash if money was worth 8 %?
65. Two vertical poles are 4 m apart. One is $2\frac{1}{2}$ m high and the other $5\frac{1}{2}$ m. How long a line will connect their tops?
66. The area of a square is 9604 sq. m. Find the length of its diagonal.
67. I bought 19 shares of manufacturing stock at 128 $\frac{3}{4}$. On the same day I received a 7 % semi-annual dividend and sold the stock at 126, no brokerage. What was my gain or loss?
68. A ladder 20 ft. long stands 12 ft. from the base of a building, and its top rests against the wall 4 ft. below the eaves. Find the height of the eaves.
69. At ₱ .12 per meter, how much more will it cost to fence a rectangular field 500 m by 125 m, than to fence a square field of the same area?
70. Find the capacity in l of a cubical tin can which will hold 89.562 Kg of olive oil. (Sp. gr. .92)
71. The capital stock of a company is ₱ 200,000. If I own 45 shares, what will be my assessment when the company loses ₱ 10,000?

EXAMINATION QUESTIONS

50. Written.

1. Define *subtrahend*, *minuend*, *multiplier*, *dividend*, *divisor*.
2. Add ₦43.75, ₦175.08, ₦1402, ₦22.12½, and ₦100.08½.
3. Multiply 22.041 by 4.007; 104½ by 85¾.
4. Divide 59,808 by 92; .12168 by 52.
5. Change to a decimal of three places $\frac{1}{15}$; $\frac{4}{18}$.
6. Write in figures (a) twenty-two thousand and seventy-three hundredths; (b) CCXLIX.
7. How many kilos of tobacco at ₦.18 per kilo can I get for 7½ cavan of maize worth ₦1.63 a cavan?
8. Find the L. C. M. of 12, 18, 30, 35, and 42.
9. Give examples of *improper fraction*, *like fractions*, *mixed number*, *complex fraction*.
10. Find the G. C. F. of 125, 175, 825, and 975.
1. $24.2 \times .0075 + .011 + 2.25 = ?$
2. $\frac{16 \times 65 \times 60 \times 80 \times 3}{15 \times 20 \times 32 \times 13 \times 70} = ?$
3. From $\frac{2}{3}$ of $\frac{3}{5}$ of $3\frac{3}{4}$ take $\frac{3}{4}$ of $\frac{4}{5}$ of $1\frac{1}{3}$.
4. A man spent $\frac{1}{5}$ of his money for a lot, $\frac{3}{4}$ of the remainder for a house, and had ₦970 left. How much had he at first?
5. Define *circle*, *circumference*, *radius*, *perimeter*, *diagonal*.
6. Change to decimals and add: $1\frac{1}{3}$, $5\frac{5}{12}$, $3\frac{5}{8}$, $2\frac{1}{3}$.
7. Simplify $\frac{\frac{4}{5} \times \frac{3}{8}}{\frac{3}{5} \times 3\frac{1}{3}} + \frac{3}{2\frac{1}{4}}$.
8. If .875 MT of coal costs ₦11.20, what will 2.65 MT cost?
9. A man bequeathed $\frac{2}{3}$ of his estate to his wife, $\frac{1}{4}$ of the remainder to his son, and what was left, ₦2200, to his daughter. How much did the wife and son receive?

10. A can do a piece of work in $2\frac{1}{2}$ days, and B can do it in 4 days. In what time can they do it working together?

1. Define *polygon*, *parallelogram*, *trapezoid*, *rectangle*, *perpendicular lines*.

2. When it is 8 p.m. in San Francisco, $122^{\circ} 25' 45''$ W., what time is it in Honolulu, $157^{\circ} 52' 45''$ W.?

3. Find the area of a parallelogram whose base is 37.5 cm and whose altitude is 6.4 cm.

4. Find the area of a trapezoid whose parallel sides are 27 cm and 33 cm, and whose altitude is 22.5 cm.

5. Find the cost of 240 redwood boards 1 in. thick, 14 in. wide, and 20 ft. long, at ₱80 per M.

6. At ₱2.75 per cubic foot, what will a stick of molave cost that is 10 in. square, and 16 ft. long?

7. At 775 Kg to the cubic meter, how many tons of coal will it take to fill a bin 4.5 m long, 2.5 m wide, and 2.4 m high?

8. Find the surface and volume of a cube whose edge is 22.5 centimeters.

9. At ₱2.14 per square meter, what will it cost to build a macadam road 645 m long, and 12.5 m wide?

10. At ₱24 per 1000, what will the bricks cost for a wall 75 m long, 2.2 m high, and 40 cm thick, if the bricks are laid 750 to the cubic meter?

1. Express as decimals: $5\frac{1}{2}\%$, 108%, $\frac{1}{4}\%$, 2.2%, 1001%.

2. Express as per cent: .8, .025, .008, .0075, 10.125, 2.25.

3. I sent an agent in San Francisco ₱24,989.50 with which to buy cement at ₱5.75 a barrel, after taking out his commission of $2\frac{1}{2}\%$. How many barrels did he buy?

4. The premium for insuring a house for $\frac{3}{4}$ of its value at $1\frac{3}{4}\%$ was ₱43.05. What was the value of the house?

5. Define *brokerage, real estate, taxes, ad valorem duty.*
6. The net cost of a bill of goods after being discounted 25 % and 10 % was ₦ 3267. What was the original bill?
7. A man sold a farm for ₦ 2565, thus losing 10 %. Had he sold it for ₦ 3135, would he have gained or lost, and what per cent?
8. What is the rate of taxation when a man pays ₦ 117 on property assessed at ₦ 15,600?
9. What per cent of $2\frac{2}{3} \times 4\frac{1}{2}$ is $3\frac{3}{4} \times 2\frac{2}{5}$?
10. A boy spent 20 % of his money for a hat, and $37\frac{1}{2}$ % of the remainder for a pair of shoes, and found that he had ₦ 3.75 left. How much had he at first?
1. What is $\frac{3}{4}$ % of ₦ 2.40? $\frac{5}{8}$ % of ₦ 720? 302 % of 40 Kg? .02 % of 800 m?
2. A merchant bought 560 Kg of potatoes at ₦ .13 per kilo. 15 % of them were spoiled. For how much per kilo must he sell the remainder in order to gain $12\frac{1}{2}$ % on the lot?
3. A lawyer collected 85 % of a debt, charging 6 % commission. If his commission was ₦ 32.64, what was the amount of the debt?
4.
$$\frac{.03 \times .0125 \times 4.8 \times .064}{1.2 \times .0096 \times 6.25 \times .04} = ?$$
5. I bought 450 piculs of sugar at ₦ 3.20 per picul. I sold 25 % of it at a gain of 20 %, 40 % of it at a gain of 25 %, and lost $33\frac{1}{3}$ % on the remainder. What was my gain per cent on the whole?
6. A music dealer sold two pianos for ₦ 455 each. On one he gained 30 %, and on the other he lost 30 %. How much did he gain or lose by the two sales?
7. A has 40 % as much money as B, and B has 75 % as much as C. If they all have ₦ 984, how much has each?

8. A grocer bought 240 eggs at ₱2.50 a hundred, and sold them at ₱.35 a dozen. How much did he gain?

9. On a bill of ₱800, what is the difference between a discount of 35 % and successive discounts of 20 %, 10 %, and 5 %?

10. What is the rate of taxation when a man pays a tax of ₱141.75 on 420 Ha of land assessed at ₱45 per hektar?

1. Define *principal*, *negotiable note*, *compound interest*.

2. Find the amount of ₱1260 for 2 yr. 8 mo. 24 da. at 9 %.

3. Find the compound interest on ₱1000 from March 1, 1906, to Sept. 1, 1909, at 8 %.

4. In what time will ₱434.20 gain ₱168.25 interest at 9 %?

5. At what rate will ₱1425 yield ₱120.41 interest in 1 yr. 4 mo. 27 da.?

6. Find the exact interest on ₱550 from July 3 to Oct. 6, of the same year, at 12 %.

7. A wholesale merchant sells goods amounting to ₱3822, on 6 months' credit. If money is worth 10 %, what cash sum should he accept in payment of the bill?

8. A note for ₱600, dated June 10, 1908, due in 4 months, with interest at 8 %, is discounted at a bank Aug. 16 at 10 %. Find the proceeds of the note.

9. What principal will amount to ₱807 in 1 yr. 3 mo. 6 da. at 6 %?

10. What sum must be invested in stock that pays a dividend of 6 % at 120 to yield an annual income of ₱3000?

1. Define *corporation*, *par value*, *dividends*, *bond*, *broker*.

2. Find the cost of 240 shares of railroad stock at $87\frac{3}{8}$, brokerage $\frac{1}{8}$ %.

3. If I invest ₱21,000 in stock that pays 5 % dividends at 120, what will be my annual income?

4. A man bought 210 shares of railroad stock at $102\frac{1}{2}$ and sold them at $108\frac{1}{2}$. What did he gain if brokerage in each case was $\frac{1}{8}\%$?

5. Which is the better investment, stock that pays 8% at 120 or stock that pays 5% at 75?

6. If brokerage is $\frac{1}{4}\%$, at what price must I buy 6% bonds that I may receive 8% on my investment?

7. A speculator invested ₱ 18,900 in stock at 105. After receiving an annual dividend of 4%, he sold the stock at $103\frac{1}{2}$. What did he gain?

8. If 8 men in 4 days of 8 hours each can build a wall 40 m long, how many days will it take 12 men working 10 hours a day to build a wall 90 m long?

9. A, B, and C entered into partnership for one year. A put in ₱ 7200, B ₱ 6600, and C ₱ 4800. If they gained ₱ 4464, what was each partner's share of the gain?

10. Divide 200 into four parts that shall be to each other as $2\frac{1}{2}$, 4, $7\frac{1}{2}$, and 11.

1. Find one edge and the volume of a cube whose entire surface is 87,846 sq. cm.

2. How far from the house must I place the foot of a ladder 6.25 m long so that it will just reach a window 5 m high?

3. Find the volume and entire surface of a pyramid whose base is 30 in. square, and whose altitude is 20 in.

4. Find the volume and entire surface of a cone whose base is 20 cm in diameter, and whose altitude is $7\frac{1}{2}$ cm.

5. What is the volume of a sphere whose radius is 15 cm?

6. At ₱.40 a liter, what is the value of the coconut oil that fills a cylindrical tank 60 cm in diameter and 80 cm high?

7. Find the surface of a sphere that is 40 cm in diameter.
8. If a liter of water exactly fills a cone-shaped glass 15 cm in diameter at the top, how deep is the glass?
9. At ₱1.50 per square meter, what will it cost to cement the sides and bottom of a cylindrical cistern 4 m in diameter and 6 m deep?
10. Find the total weight of a spherical brass shell full of water, the inside diameter of the shell being 20 cm and the outside diameter 22 cm. (Sp. gr. of brass is 8.5.)
 1. Define *percentage*, *interest*, *promissory note*, *assessor*.
 2. A farm that cost ₱5350 was sold for ₱7490. What was the gain per cent?
 3. A jeweler sold two watches at ₱48 each. On one he gained 20 % and on the other he lost 20 %. What did each watch cost him?
 4. An auctioneer charged 5 % commission and received ₱43.20 for his services. What was the value of the goods that he auctioned?
 5. If I send my agent ₱367.20 with instructions to buy tea at ₱.60 per lb., and he charges 2 % for buying, how many pounds of tea should I receive?
 6. Which is the better investment, and how much better, 5 % stock at 104 or 4 % stock at 80?
 7. What must be paid for a bill of goods amounting to ₱936, if 15 % and 10 % off are allowed?
 8. On Dec. 21, 1907, John Smith borrowed ₱484, agreeing to pay interest at 5 %. He paid the debt in full on March 3, 1909. How much did he pay?
 9. A rope 150 ft. long fastened to the top of a flagpole reaches the ground 40 ft. from the base. How high is the pole?

10. If 50 men working 10 hours a day for 11 days can dig 250 ft. of a canal 60 ft. wide and 5 ft. deep, how many feet of a canal 90 ft. wide and 7 ft. deep can 140 men dig in 22 days of 8 hours each?

1. (a) I paid ₦125 for a horse and sold it for ₦135. What per cent did I gain?

(b) An agent received ₦28.80 for collecting a debt. How much did he collect, if his commission was 5%?

2. If a grocer buys sugar listed at ₦.22 a kilo, at a discount of 10%, and sells it at ₦.23 $\frac{1}{10}$ a kilo, what is his gain per cent?

3. Simplify $\frac{3\frac{1}{2} - 2\frac{3}{4}}{\frac{2}{3} \text{ of } \frac{1\frac{1}{2}}{1\frac{1}{8}}} \times \frac{\frac{3}{8}}{7\frac{1}{2}}$.

4. Find the total duty on 25 bicycles costing ₦64.40 each, duty 20%; 12 watches costing ₦22.50 each, duty 20%; and 28 clocks costing ₦37.50 each, duty 25%.

5. Find the simple interest on ₦487.50 from Oct. 4, 1904, to April 22, 1907, at 12% per annum.

6. (a) What principal put at interest at 12% for 2 yr. 3 mo. 15 da. will amount to ₦612.26?

(b) In what time will ₦95 put at interest at 6% amount to ₦101.27?

7. How far apart are the opposite corners of a square field that contains 12.25 Ha?

8. Find the square root of 5415.4881.

9. Goods that are marked 25% above cost are sold 10% below the marked price. What is the gain per cent?

10. A and B can do a piece of work in 16 days, B and C can do it in 14 days, and A and C can do it in 13 days. How long will it take all of them to do the work together?

REDUCTION

51. Written.

Refer to the table of English equivalents in solving the following problems.

1. How many square meters are there in a floor 30 ft. square?

2. What will 500 pounds of beef cost at ₱.80 per kilo?

3. A field is 200 m square. How many acres does it contain?

4. A farmer has a bin 4 m by 2 m by $1\frac{1}{4}$ m. How many bushels will it hold?

5. How many cubic feet of air are there in a room 5 m by 4 m by 3 m?

6. How many pounds will the water weigh that fills a tank 40 cm by 25 cm by 20 cm?

7. A wheel 3 m in circumference will make how many revolutions in going 1 mile?

8. Find the weight of a gallon of water in kilos. In pounds.

9. How many kilos will a block of marble weigh that is 4 ft. long, $2\frac{1}{2}$ ft. wide, and 2 ft. thick, the specific gravity of marble being 2.7?

10. A farmer bought 100 acres of land for ₱5000, and sold it for ₱140 per hektar. How much did he gain?

11. At ₱1.80 per cubic yard, what is the value of the crushed rock that fills a bin 5 m by 4 m by 2 m?

12. A merchant bought 500 lb. of sugar for ₱47.50 and sold it at ₱.25 per kilo. How much did he gain?

13. What is the weight of a cubic foot of water in kilos? In pounds?

14. How many pounds will a cubic foot of iron weigh? (Sp. gr. 7.8)

15. A merchant bought 100 gallons of alcohol at ₱1.40 per gallon and sold it at ₱.50 per liter. How much did he gain?
16. A merchant bought 400 yards of silk at ₱2.50 a yard. For how much per meter must he sell it in order to gain 20%?
17. Find the weight in pounds of 10 cu. ft. of ice. (Sp. gr. .92)
18. A peso weighs 20 grams. How many pounds will 1000 pesos weigh?
19. At ₱59 per kilo, what will a 5-cm cube of silver cost? (Sp. gr. 10.5)
20. What would a cubic foot of the silver in No. 19 cost?
21. If $\frac{1}{8}$ of the weight of a peso weighing 20 grams is copper, what volume of copper (sp. gr. 8.9) is put into 5000 pesos?
22. The sp. gr. of mercury is 13.6. How many pounds will half a liter of mercury weigh?
23. How many square meters are there in the area of a circle 10 ft. in diameter?
24. How many gallons are there in 20 hektoliters?
25. If the sp. gr. of petroleum is .80, how many pounds will 20 liters of petroleum weigh?
26. How many square centimeters are there in 100 sq. in.?
27. How many cubic meters are there in 20 pieces of timber each 1 ft. square and 20 ft. long?
28. What price per acre is equivalent to ₱140 per hektar?
29. At ₱4.20 per kilo, what will 10 cu. in. of nickel cost? (Sp. gr. 8.9)
30. At ₱.80 a liter, what will 10 gallons of alcohol cost?
31. How many cavanese are there in 10 bushels? How many chupases?

THE EQUATION

INTRODUCTION TO THE EQUATION

52. Oral.

1. Five added to what number equals 15?
2. What number added to 6 equals 10?
3. What number diminished by 5 equals 12?
4. Ten subtracted from what number equals 7?
5. Four times what number equals 40?
6. What number increased by 20 equals 32?
7. Forty-five is 9 times a certain number. What is the number?
8. A certain number divided by 8 equals 7. What is the number?

What number multiplied by 7 equals 896?

If we use the letter " n " instead of the word "number," the solution may be written :

$$7 \times n = 896$$

$$n = 896 \div 7 = 128$$

When either or both of the factors are letters, the product is indicated by writing the factors with no sign between them.

Thus, $6n$ means the same as $6 \times n$; ab means $a \times b$.

I bought 7 suits of clothing for \$245. What was the cost of each suit?

If c represents the cost of each suit,

$$7 \times c \text{ or } 7c = \$245$$

$$c = \$245 \div 7 \text{ or } \$35$$

Notice that n and c in the above solutions represent numbers whose values are unknown at the outset, but which become known when the solutions are completed.

The systematic use of such abbreviations is one of the chief differences between arithmetic and algebra.

53. Written.

Write out the solutions for the following problems, using such abbreviations as may be found convenient:

1. Twenty-five times a certain number equals 1000. What is the number?

2. A library contains 3200 books arranged on 25 shelves of equal length. What is the average number of books on each shelf?

3. Twelve tons of coal cost ₱108.84. What was the price per ton?

4. How many days will be required to dig a canal 1284 m long, 42 m wide, and 15 m deep, if 642 cu. m of dirt are removed each day?

Five times a certain number plus 2 times the same number equals 28. What is the number?

5 times the number plus 2 times the number is 7 times the number. If n represents the number, $5n + 2n = 7n$. $7n = 28$. $n = 4$.

5. Six times a certain number less 2 times the same number equals 40. What is the number? $6n - 2n = 40$. $n = ?$

6. Four times a number subtracted from 9 times the same number equals 55. What is the number? $9n - 4n = 55$. $n = ?$

7. Six times a number plus 4 times the same number less 3 times the same number equals 42. What is the number?

8. Eight times a number plus 10 times the same number less 7 times the same number equals 253. What is the number?

9. 3 times a number plus 2 times the same number plus 5 times the same number equals 60. What is the number?

10. 5 times a number plus 4 times the same number minus 3 times the same number equals 56 minus 20. What is the number?

Find the numbers represented by n , x , y , and z in the following:

- | | |
|---------------------------|-------------------------------|
| 11. $3n + 4n = 56$ | 19. $9n + 6n - 11n = 84$ |
| 12. $12x - 7x = 45$ | 20. $4x + 3x = 20 + 8$ |
| 13. $20x - 11x = 36$ | 21. $8x - 3x = 18 - 3$ |
| 14. $14n - 6n = 64$ | 22. $3y + 9y = 44 - 20$ |
| 15. $8y + 5y - 3y = 120$ | 23. $14y - 6y = 22 + 10$ |
| 16. $4n + 6n - 8n = 5$ | 24. $2n + 2n - n = 96$ |
| 17. $10z + 8z + 2z = 40$ | 25. $8z + 3z - 10z = 24 - 12$ |
| 18. $12z + 12z + 6z = 90$ | 26. $3x + 4x + 5x = 48 + 12$ |

54. Oral.

If $x + 5 = 14$,
then $x = 9$,
because $9 + 5 = 14$.

If $14 - x = 3$,
then $x = 11$,
because $14 - 11 = 3$.

Find the numbers represented by x in each of the following.

- | | | |
|------------------|-------------------|--------------------|
| 1. $x + 6 = 8$ | 8. $x - 9 = 22$ | 15. $x + 20 = 60$ |
| 2. $x - 4 = 2$ | 9. $x - 14 = 2$ | 16. $100 - x = 80$ |
| 3. $x + 5 = 7$ | 10. $18 + x = 23$ | 17. $x - 40 = 60$ |
| 4. $12 + x = 20$ | 11. $34 - x = 27$ | 18. $45 + x = 60$ |
| 5. $40 - x = 32$ | 12. $x - 11 = 11$ | 19. $x + 8 = 100$ |
| 6. $x + 11 = 25$ | 13. $x + 6 = 17$ | 20. $75 - x = 50$ |
| 7. $25 - x = 18$ | 14. $9 + x = 62$ | 21. $x - 20 = 100$ |

If $a = 2$, $b = 3$, and $c = 5$,

- | | | |
|-----------------|---------------------|------------------------|
| 22. $a + b = ?$ | 28. $c - b = ?$ | 34. $ac + b = ?$ |
| 23. $c - a = ?$ | 29. $a + b + c = ?$ | 35. $abc - b = ?$ |
| 24. $b + c = ?$ | 30. $b + c - a = ?$ | 36. $ab + bc + ac = ?$ |
| 25. $ab = ?$ | 31. $a + c - b = ?$ | 37. $ac - ab + bc = ?$ |
| 26. $bc = ?$ | 32. $ab - c = ?$ | 38. $abc - bc = ?$ |
| 27. $abc = ?$ | 33. $bc - a = ?$ | 39. $ac + b - c = ?$ |

PRINCIPLES USED IN THE SOLUTION OF THE EQUATION

55. Oral.

On the scale-pans of a common balance are placed one-centavo pieces. The scales balance only when the number of coins is the same in both pans.

The scales will remain in balance when the following changes are made in the coins :

(1) When the number of coins in the two pans is increased by the same number.

(2) When the number of coins in the two pans is diminished by the same number.

(3) When the number of coins in each pan is left unchanged, but the coins are rearranged in groups or piles in any manner.

Any representation of numbers by figures, by letters, or by both is called a **number expression**, as 25, $2d$, $x + 5$, and $ac - 4$.

An **equation** is a statement that two number expressions are equal, as $x - 2 = 40$, $x - 2 = 2x - 6$.

The number expressions are called **members** of the equation.

An equation is like a balance, and its members may be changed only in such ways as to keep the balance.

The following changes may be made in an equation without destroying the equality :

(a) Adding the same number to both members.

(b) Subtracting the same number from both members.

(c) Multiplying both members by the same number.

(d) Dividing both members by the same number.

(e) Changing the form of either member in any way which leaves its value unchanged.

For example :

If	$5x - 30 = 120,$
adding 30 to both members,	$5x - 30 + 30 = 120 + 30,$
	$5x = 150,$
dividing both members by 5,	$x = 30.$

If $3x + 10 = 70$,
 subtracting 10 from both members, $3x + 10 - 10 = 70 - 10$,
 $3x = 60$,
 dividing both members by 3, $x = 20$.
 If $\frac{4x}{5} = 32$,
 multiplying both members by 5, $\frac{4x}{5} \times 5 = 32 \times 5$,
 $4x = 160$,
 dividing both members by 4, $x = 40$.

56. Written.

Using the principles stated above, find the values of x , y , and z in the following equations :

- | | |
|---------------------------------|-----------------------------|
| 1. $12x - 7x = 25 - 10$ | 18. $6x - 40 = 5x + 60$ |
| 2. $3y - 10 = 80$ | 19. $8y + 16 = 4y + 100$ |
| 3. $40x - 16 = 64$ | 20. $9z - 3 = 2z + 81$ |
| 4. $7z - 12 + 3z = 20 + 8$ | 21. $15y - 30 = 170 - 5y$ |
| 5. $14y - 33 - 6y = 17 + 6$ | 22. $45 - 3x = 171 - 24x$ |
| 6. $120 - 2x + 9x = 134$ | 23. $19 - 5z = 299 - 40z$ |
| 7. $5z + 5z + 20 = 80$ | 24. $50y + 80 = 370 - 8y$ |
| 8. $13 + 12y - 4y = 75 - 6$ | 25. $16x + 22 = 5x + 99$ |
| 9. $3x + 9x + 7 = 103$ | 26. $95z - 52z = 346 + 84$ |
| 10. $18z + 14 - 7z = 69$ | 27. $82x + 73x = 300 + 320$ |
| 11. $25x - 4x - 3 = 137 + 7$ | 28. $35x - 15 = 10x + 660$ |
| 12. $4 + 6y + 2y = 100$ | 29. $19z + 16z = 700 - 560$ |
| 13. $11 - 8z + 10z = 42 + 5$ | 30. $9y - 16 = 5y + 80$ |
| 14. $42x - 6 - 6x = 210$ | 31. $14z - 64 = 2z + 44$ |
| 15. $7y + 15y - 8 = 54 + 4$ | 32. $11x - 6 = 5x + 174$ |
| 16. $18y - 12 + 12y = 49 + 29$ | 33. $12 + 18y = 4y + 124$ |
| 17. $75 + 40x - 15x = 500 + 25$ | 34. $42 - 6z = 102 - 18z$ |

SOLUTION OF PROBLEMS BY MEANS OF THE EQUATION**57. Written.**

A cart and carabao together cost ₱125. The carabao cost 4 times as much as the cart. Find the cost of each.

Let x = cost of cart.
Then $4x$ = cost of carabao,
and $x + 4x$, or $5x$ = cost of both.
 $5x = ₱125$.
 $x = ₱25$, cost of cart.
 $4x = ₱100$, cost of carabao.

The sum of two numbers is 84, and the greater is 6 times the less. What are the numbers?

Let x = the smaller number.
Then $6x$ = the greater number,
and $x + 6x$, or $7x$ = the sum of the numbers.
 $7x = 84$.
 $x = 12$, the smaller number.
 $6x = 72$, the greater number.

1. A boy paid ₱.90 for a book and a tablet. The book cost 5 times as much as the tablet. Find the cost of each.

2. Juan's money is 7 times Pedro's, and together they have \$2.40. How much has each?

3. Three times a certain number added to 11 times the same number equals 154. Find the number.

4. A farmer paid ₱136 for an equal number of goats and sheep, paying ₱5 apiece for the goats and ₱12 apiece for the sheep. How many of each did he buy?

5. The difference between 9 times a certain number and 4 times the same number is 45. What is the number?

6. What number increased by 7 times itself equals 88?

7. A farmer has twice as many piculs of sugar as he has of hemp. If he has 87 piculs of both, how many has he of each?

8. I wish to buy an equal number of coconuts and pineapples and I have ₱1.98 to spend. How many of each can I buy when coconuts are worth 3 centavos each and pineapples 8 centavos?

9. The duty on men's shoes is ₱.60 per pair and on boys' shoes ₱.40 per pair. If a dealer paid ₱16.80 duty on a consignment containing twice as many boys' shoes as men's, how many pairs of each were there in the consignment?

10. The distance around a square field is 320 meters. What is its area?

11. Mr. Agrava deposited a certain sum in a savings bank in January, twice as much in February, and in March as much as in the two preceding months. How much did he deposit in each of the three months if his total deposit was ₱270?

12. With ₱3.20 I wish to buy 10-centavo, 4-centavo, and 2-centavo stamps so that I shall have the same number of each. How many of each kind shall I get?

13. I paid ₱140 for a horse and a cow, paying ₱40 more for the horse than for the cow. How much did I pay for each?

14. In a certain school which has enrolled 164 pupils, there are three times as many boys as girls. How many are there of each?

15. If to 4 times a certain number I add 3 times the same number, the sum will be 147. What is the number?

16. The sum of two numbers is 144. If the greater is 11 times the smaller, what are the numbers?

17. If to 21 times a certain number I add 16, the result is 100. What is the number?

18. Three times a certain number subtracted from 16 times the same number equals 273. What is the number?

19. If to 5 times a certain number 4 times the number and 20 be added, the sum will be 92. What is the number?

20. Juan and José together have 41 marbles. If Juan has 5 more than twice as many as José, how many marbles has each?

21. Forty-one plus 4 is 15 more than 3 times what number?

22. Divide 120 into three parts such that the second shall be twice the first, and the third 3 times the first.

Let x = the first part, $2x$ = the second, and $3x$ = the third.

23. The sum of the ages of father and son is 54 years. If the father's age is 6 years less than 4 times the son's age, what is the age of each?

24. A, B, and C entered into partnership with a joint capital of ₱8400. Of this A put in twice as much as B, and B put in twice as much as C. What did each put in?

25. Divide 135 into three parts such that the second shall be 20 more than the first, and the third 20 more than the second.

26. Thirty-five centavos was divided between Pedro and Rafael so that Pedro got $2\frac{1}{2}$ times as much as Rafael. What was the share of each?

27. The sum of three numbers is 99. The first is 10 greater than the second, and 20 greater than the third. What are the numbers?

28. A cow and a goat together cost ₱37. If the cow cost 6 times as much as the goat plus ₱2, what was the cost of each?

29. The length of a field is 5 times its width. If the distance around it is 600 m, what are its dimensions?

30. A, B, and C together have ₱145. A has ₱20 more than B, and B has twice as much as C. How much has each?

31. The sum of the ages of A, B, and C is 88 years. A is 7 years older than B and 5 years younger than C. Find the age of each.

32. If it takes 844 m of fence to inclose a square lot, what are the dimensions of the lot?

33. A, B, and C together have ₱ 280. A has 3 times as much as B, and C has as much as A and B together. How much has each?

34. A pole 90 ft. long is partly in the mud, partly in the water, and partly in the air. The length in the water is twice the length in the mud, and the length in the air is 3 times the length in the water. Find the length of each part.

35. The sum of 4 numbers is 86. The first is 1 greater than the second, the second is 1 greater than the third, and the third is 1 greater than the fourth. Find the numbers.

Let x = the fourth number.

36. A horse, a cow, and a sheep are together worth ₱ 116. The cow is worth 9 times as much as the sheep, and the horse is worth ₱ 40 more than the cow. Find the value of each.

37. At a certain election 5462 votes were cast for two candidates, the successful one receiving 542 more votes than his opponent. How many votes did each receive?

38. The sum of two numbers is 154 and their difference is 4. What are the numbers?

Let x = the less number, and $x + 4$ the greater.

39. Divide 50 into two parts whose difference shall be 26.

40. In a company of 180 persons composed of men, women, and children, there are three times as many children as men, and twice as many women as men. How many are there of each?

41. Divide one meter of tape into two parts so that one part shall be six centimeters longer than the other.

58. Written.

One third of a number is 10. What is the number?

Let x = the number. Then $\frac{1}{3}$ of x may be written $\frac{x}{3}$, and read x divided by 3 or x over 3.

$$\text{If} \quad \frac{x}{3} = 10,$$

$$\text{multiplying both members by 3,} \quad x = 30.$$

Therefore the number is 30.

One fifth of a number plus three fourths of the same number is 19. What is the number?

Let

x = the number.

Then

$$\frac{x}{5} + \frac{3x}{4} = 19.$$

Multiplying both members by 20,

$$4x + 15x = 380,$$

$$19x = 380.$$

Dividing both members by 19,

$$x = 20.$$

Therefore the number is 20.

To clear an equation of fractions, multiply both members by the lowest common denominator of the fractions.

1. $\frac{1}{2}$ of a number plus $\frac{3}{4}$ of the same number is 20. What is the number?

2. $\frac{1}{2}$ of a number plus $\frac{1}{3}$ of the same number is 25. What is the number?

3. $\frac{3}{4}$ of a number minus $\frac{1}{3}$ of the same number is 40. What is the number?

4. $\frac{7}{8}$ of a number minus $\frac{5}{8}$ of the same number is 10. What is the number?

5. The difference between the fifth and seventh parts of a certain number is 2. What is the number?

6. The fifth part of a certain number added to its seventh part equals $\frac{1}{2}$ of the number minus 11. What is the number?

59. Written.

Find the values of x , y , and z in the following equations:

1. $\frac{2x}{5} = 12$

11. $\frac{x}{2} + \frac{x}{3} = 25$

21. $\frac{3x}{4} - \frac{x}{2} = 6$

2. $\frac{3y}{4} = 18$

12. $\frac{x}{6} + \frac{x}{3} = 9$

22. $\frac{x}{3} - \frac{x}{6} = 5$

3. $\frac{4z}{5} = 24$

13. $\frac{z}{4} + \frac{z}{3} = 14$

23. $\frac{2x}{3} - \frac{x}{2} = 7$

4. $\frac{5x}{6} = 20$

14. $\frac{z}{5} + \frac{z}{4} = 9$

24. $\frac{3y}{4} + \frac{y}{2} = 35$

5. $\frac{3x}{7} = 21$

15. $\frac{y}{2} + y = 6$

25. $\frac{y}{2} + \frac{3y}{5} = 11$

6. $\frac{5y}{7} = 20$

16. $\frac{y}{2} - \frac{y}{4} = 8$

26. $\frac{z}{4} - \frac{z}{5} = 3$

7. $\frac{3z}{8} = 15$

17. $\frac{x}{4} + 2x = 18$

27. $\frac{x}{2} - \frac{x}{3} = 11$

8. $\frac{5z}{9} = 25$

18. $3x - \frac{x}{2} = 15$

28. $\frac{4x}{5} - \frac{x}{2} = 12$

9. $\frac{8y}{11} = 24$

19. $5x - \frac{x}{2} = 18$

29. $\frac{5x}{2} - x = 33$

10. $\frac{7x}{8} = 28$

20. $3x - \frac{x}{3} = 16$

30. $\frac{3x}{4} + \frac{3x}{4} = 36$

The sum of two numbers is 32, and the smaller is $\frac{3}{5}$ of the larger. What are the numbers?

Let

x = the larger number.

Then

$\frac{3x}{5}$ = the smaller number,

and

$$x + \frac{3x}{5} = 32.$$

Multiplying both members by 5,

$$5x + 3x = 160,$$

$$8x = 160.$$

Dividing both numbers by 8,

$x = 20$, the larger number.

$\frac{3x}{5} = 12$, the smaller number.

31. $\frac{3}{8}$ of a number added to $\frac{1}{4}$ of the same number is 54. What is the number?

32. $\frac{3}{8}$ of a number subtracted from $\frac{3}{4}$ of the same number is 24. What is the number?

33. The difference between $\frac{5}{8}$ of a number and $\frac{3}{4}$ of the same number is 17. What is the number?

34. Divide 79 into three parts such that the second shall be $\frac{2}{5}$ of the first, and the third $\frac{3}{8}$ of the first.

35. The sum of the ages of A and B is 56 years. If B is $\frac{3}{4}$ as old as A, what is the age of each?

36. The width of a field is $\frac{3}{5}$ of its length. If the distance around the field is 800 m, what are its dimensions?

37. A, B, and C together have ₹ 67. B has ₹ 5 more than $\frac{3}{4}$ as much as A, and C has ₹ 2 more than $\frac{1}{5}$ as much as A. How much has each?

38. I bought a watch, chain, and ring for ₹ 75, paying $\frac{1}{2}$ as much for the chain as for the watch, and $\frac{3}{4}$ as much for the ring as for the chain. What was the price of each?

39. A farmer has $\frac{2}{3}$ as many cows as sheep, and $\frac{3}{8}$ as many horses as cows. How many has he of each, if he has 93 all together?

40. What number increased 25 % (or $\frac{1}{4}$) of itself equals 75?

$$x + \frac{x}{4} = 75.$$

41. What number decreased 30 % of itself equals 91?

42. A dealer sold a piano for ₹ 576, thus gaining 20 %. What was the cost of the piano?

43. Divide ₹ 720 among A, B, and C so that B will have 20 % more than A, and C will have 40 % more than A.

44. A man sold a farm for ₹ 2700, thus losing 10 %. What did the farm cost?

45. A, B, and C went into partnership with ₹7500 capital. Of this B put in ₹400 more than $\frac{2}{3}$ as much as A, and C put in ₹600 more than $\frac{1}{2}$ as much as A. How much did each put in?

46. A man paid $\frac{5}{8}$ as much for a cow as he paid for a horse. If he paid ₹30 more for the horse than for the cow, how much did he pay for each?

47. $\frac{5}{8}$ of a number + $\frac{3}{4}$ of it + $\frac{4}{5}$ of it - $\frac{3}{10}$ of it equals 75. What is the number?

48. One number is $\frac{2}{3}$ of another and their sum is 125. What are the numbers?

Find the values of x , y , and z in the following:

- | | | |
|--|---|--|
| 49. $\frac{x}{4} + \frac{x}{8} = 9$ | 58. $x - \frac{x}{25} = 48$ | 67. $\frac{5x}{8} + \frac{3x}{4} + \frac{x}{6} = 37$ |
| 50. $\frac{2x}{5} + \frac{x}{3} = 33$ | 59. $x + \frac{7x}{20} = 54$ | 68. $\frac{2y}{5} + \frac{7y}{10} - \frac{y}{3} = 23$ |
| 51. $\frac{3x}{4} - \frac{2x}{7} = 13$ | 60. $3y - \frac{4y}{5} = 121$ | 69. $\frac{3y}{5} + \frac{9y}{10} + \frac{y}{2} = 100$ |
| 52. $\frac{5y}{6} - \frac{y}{3} = 3$ | 61. $6y - \frac{3y}{4} = 105$ | 70. $\frac{3z}{4} + \frac{z}{2} - \frac{2z}{11} = 47$ |
| 53. $2\frac{1}{2}y + \frac{y}{4} = 88$ | 62. $8\frac{1}{2}y + \frac{y}{3} = 106$ | 71. $6\frac{3}{4}x - 2\frac{1}{8}x = 159$ |
| 54. $\frac{5y}{7} - \frac{y}{2} = 30$ | 63. $4\frac{1}{2}x - 1\frac{1}{4}x = 65$ | 72. $2x + 5x - \frac{3x}{4} = 50$ |
| 55. $\frac{2z}{3} + \frac{3z}{5} = 38$ | 64. $5\frac{1}{8}z + 16 = 80$ | 73. $\frac{2y}{3} - \frac{y}{4} + \frac{5y}{6} = 15$ |
| 56. $\frac{3z}{5} - \frac{z}{7} = 16$ | 65. $\frac{41x}{100} + \frac{7x}{50} = 110$ | 74. $\frac{4y}{5} - \frac{y}{3} + y = 88$ |
| 57. $2\frac{1}{8}x - \frac{x}{2} = 77$ | 66. $3\frac{5}{8}y - 8 = 50$ | 75. $6\frac{1}{2}z - 2\frac{1}{4}z + z = 126$ |

60. Written.

$$\begin{aligned}\text{If } x + 5 &= 10 \\ x + 5 - 5 &= 10 - 5 \\ x &= 10 - 5 \\ x &= 5\end{aligned}$$

$$\begin{aligned}\text{If } x - 5 &= 20 \\ x - 5 + 5 &= 20 + 5 \\ x &= 20 + 5 \\ x &= 25\end{aligned}$$

$$\begin{aligned}\text{If } 4y &= 2y + 10 \\ 4y - 2y &= 2y + 10 - 2y \\ 4y - 2y &= 10 \\ 2y &= 10 \\ y &= 5\end{aligned}$$

$$\begin{aligned}\text{If } 4y &= 20 - y \\ 4y + y &= 20 - y + y \\ 4y + y &= 20 \\ 5y &= 20 \\ y &= 4\end{aligned}$$

From the above examples it is evident that if the same number be added to both members of an equation, or subtracted from both members of an equation, the effect is the same as if the number were taken from one member and placed in the other member with its sign changed. Hence, we say:

A number may be transferred, or **transposed**, from one member of an equation to the other, provided its sign be changed.

In the following equations, transpose the unknown numbers to the first member and the known numbers to the second member, and find the values of x , y , and z :

1. $x - 4 = 12$

9. $3z - 39 = 0$

15. $\frac{3x}{4} = 12 - \frac{x}{4}$

2. $2x + 6 = 10$

10. $10x - 10 = 5x$

3. $4x - 12 = 8$

11. $12x - 20 = 16$

16. $\frac{4x}{5} - 10 = 30$

4. $7y = 2y + 15$

12. $x = \frac{x}{2} + 10$

17. $\frac{z}{2} = 20 + \frac{z}{4}$

5. $9y = 4y + 25$

13. $3y - 20 = y$

7. $4z = 10 - z$

14. $\frac{2y}{3} - 10 = 10$

18. $\frac{y}{2} - 10 = \frac{y}{4}$

8. $3x - 9 = 0$

19. $15y = 35 + 10y$ 27. $\frac{3y}{7} - 8 = 4$ 32. $\frac{5y}{8} - 5 = 25$
 20. $2y = 24 - 4y$
 21. $25z - 15z = 20$ 28. $\frac{z}{3} + 6 = 10$ 33. $\frac{2y}{3} - \frac{y}{3} - 6 = 0$
 22. $13z - 50 = 3z$
 23. $9x = 10 + 4x$ 29. $\frac{z}{4} = 9 - \frac{z}{2}$ 34. $x - 10 = \frac{x}{3} + 6$
 24. $8x = 10x - 10$
 25. $\frac{3x}{5} = \frac{2x}{5} + 6$ 30. $\frac{x}{2} + \frac{x}{4} - 12 = 0$ 35. $\frac{x}{2} - \frac{x}{3} + 5 = 10$
 26. $\frac{4y}{5} - 10 = 14$ 31. $\frac{3x}{4} - \frac{x}{2} - 3 = 0$ 36. $\frac{x}{6} - 4 - 7 = 21$

61. Written.

1. The sum of two numbers is 65, and their difference is 15. What are the numbers?

2. Forty added to six times a number equals eleven times the same number. What is the number?

3. The sum of two numbers is 200, and three times the smaller equals the greater less 40. What are the numbers?

Let x = the smaller, and $200 - x$ = the greater number.

4. $\frac{1}{4}$ of a number plus $\frac{1}{3}$ of the same number minus 50 equals 20. What is the number?

5. Divide 300 into two parts whose difference shall be 60.

6. Divide ₦17.50 among A, B, and C, so that B may receive ₦.50 more than 3 times as much as A, and C ₦.50 less than 3 times as much as A.

7. If from 25 times a certain number I subtract 75 and 75, the result will be 475. What is the number?

8. B has twice as much money as A, and C has $\frac{1}{3}$ as much as B. If they have ₦136 together, how much has each?

9. What number multiplied by 15 is 60 less than the same number multiplied by 19?

10. A tree 30 m high was broken off so that the part which fell down was 7 m longer than the part which remained standing. How long was each part?

11. The sum of two numbers is 80. The greater is 5 more than 4 times the smaller. What are the numbers?

12. Juan is 3 years less than 5 times as old as his brother, and the sum of their ages is 21 years. How old is each?

13. What number multiplied by $5\frac{1}{2}$ is 32 greater than $1\frac{1}{2}$ times the same number?

14. The length of a rectangular lot is 3 times its width plus 4 m. The distance around it is 184 m. Find its dimensions.

15. A man paid ₱54 for a watch and chain. He paid for the chain ₱2 less than $\frac{1}{3}$ as much as he paid for the watch. How much did he pay for each?

16. The amount of a certain principal for 3 years at 10% is ₱585. What is the principal?

17. The net price of a bill of goods discounted 22% is ₱507. What was the list price of the goods?

18. A dealer marked a carriage 30% above cost. He sold it for ₱400, which was ₱55 below the marked price. What was the cost of the carriage?

19. The sum of three numbers is 216. The second is twice the first, and the third is 20% greater than the second. What are the numbers?

20. $\frac{4}{5}$ of a certain number plus 20 equals $\frac{3}{10}$ of the same number plus 30. What is the number?

21. An agent received ₱51 commission for selling ₱1700 worth of goods. What was his rate of commission?

62. Written.

Find the values of x , y , and z in the following equations :

- | | |
|---|--|
| 1. $2x - 42 = 28$ | 13. $22z - 41 = 7z + 4$ |
| 2. $8y + 25 = 225$ | 14. $8z - 24 + 4z = 144$ |
| 3. $9x - 20 = 2x + 120$ | 15. $12x + 10 + 8x = 4x + 42$ |
| 4. $12z + 22 = 72 - 13z$ | 16. $20y - 40 = 8y + 80 + 6y$ |
| 5. $21z = 270 - 9z$ | 17. $11y + 12 - 4y = 3y + 48$ |
| 6. $15y - 351 = 6y$ | 18. $15z = 45 - 5z + 15$ |
| 7. $22x - 25 = 6x + 375$ | 19. $14x - 42 = 6x + 8 + 3x$ |
| 8. $21y - 5 = 220 - 4y$ | 20. $9x - 42 = 10 - 6x - 37$ |
| 9. $\frac{13x}{8} + 32 = \frac{5x}{8} + 56$ | 21. $\frac{2y}{9} + y = \frac{4y}{9} + 14$ |
| 10. $\frac{3z}{10} - 20 = \frac{z}{5} - 16$ | 22. $3y - 50 - \frac{y}{4} = \frac{3y}{8} + 7$ |
| 11. $\frac{4x}{7} + 14 = \frac{x}{2} + 15$ | 23. $\frac{3x}{4} + \frac{5x}{6} - 6 = 10 + \frac{x}{4}$ |
| 12. $\frac{2y}{3} + \frac{y}{6} - 25 = 0$ | 24. $4y + 30 = \frac{5y}{6} + 105 + \frac{2y}{3}$ |

63. Written.

1. What is the number whose third, fourth, and sixth parts added make 18?

2. A certain number added to 10 equals 5 more than $1\frac{1}{2}$ times the number. What is the number?

3. A is 3 times as old as B, but in 10 years he will be twice as old as B. How old is each?

4. A, B, and C have together ₦115. B has ₦6 more than $\frac{2}{3}$ as much as A, and C has ₦2 less than $\frac{1}{2}$ as much as A. How much has each?

5. If I multiply a certain number by $2\frac{1}{2}$, add 20 to the product, and divide the sum by 6, the quotient is 20. What is the number?

6. A man spent $\frac{1}{2}$ of his money for a farm, $\frac{1}{8}$ of it for a house, $\frac{1}{10}$ of it for furniture, and had ₦300 left. How much had he at first?

7. A man lost 15% of his money, and had ₦1890 more than $\frac{1}{2}$ of it left. How much had he at first?

8. Divide 100 into two parts such that $\frac{2}{3}$ of the first part minus 10 shall equal $\frac{1}{2}$ of the second part plus 10.

9. A man has ₦3.40 in 20-centavo and 10-centavo pieces. If he has 10 more 10-centavo pieces than 20-centavo pieces, how many has he of each?

10. What number increased by 16% of itself and then decreased by 106 equals 300?

11. $\frac{2}{5}$ of a certain number plus $\frac{2}{7}$ of it minus $\frac{1}{2}$ of it equals 13. What is the number?

12. 2 times a certain number plus $1\frac{3}{4}$ times the number plus $2\frac{1}{8}$ times the number equals 71. What is the number?

13. The sum of two numbers is $2\frac{1}{4}$ times the less, and their difference is $2\frac{1}{2}$. What are the numbers?

14. The width of a rectangular lot is 20 m less than its length. Its perimeter is 160 m. Find its length, width, and area.

15. The sum of three numbers is 90. The second is 10 more than $\frac{1}{2}$ of the first, and the third is 10 more than the second. What are the numbers?

16. The sum of the ages of A, B, and C is 60 years. A is $\frac{4}{5}$ as old as B, who is 10 years older than C. What is the age of each?

17. What sum of money put at interest for 4 years at 8 % will amount to ₦594?

18. A father is 3 times as old as his son. In 12 years he will be twice as old. How old is each?

19. A has twice as much money as B. If A gives B ₦5, he will have $1\frac{1}{2}$ times as much as B. How much had each at first?

20. Divide 84 into two parts such that $\frac{3}{4}$ of the smaller plus 5 equals $\frac{2}{3}$ of the larger.

21. The sum of two numbers is 60. The greater divided by the less equals 4. What are the numbers?

22. A jeweler paid the same price for each of two watches. He sold them both for ₦98, thus gaining 25 % on one and 20 % on the other. What did the watches cost?

23. A commission merchant received ₦2625 with which to buy flour and pay his own commission at 5 %. Find the cost of the flour.

24. A man paid ₦1220 for 8 cows and 12 horses. If each horse cost ₦5 less than twice as much as each cow, how much did he pay for each cow and each horse?

25. A sold a horse to B and gained 25 %. B sold it to C for ₦125 and gained 25 %. What did the horse cost A?

26. There are 335 pupils in a certain school. $\frac{3}{5}$ of the number of boys plus 10 equals $\frac{2}{3}$ of the number of girls minus 11. How many boys and how many girls are there in the school?

27. A, B, C, and D have together ₦22.50. A has half as much as B, B has half as much as C, and C has half as much as D. How much has each?

28. A has $\frac{1}{12}$ of a certain sum of money, B has $\frac{3}{10}$ of it, C has $\frac{1}{6}$ of it, and D has the remainder, ₦10. How much have A, B, and C?

29. A father is 36 years old and his son is 6. In how many years will the son's age be $\frac{1}{3}$ of the father's?

30. The sum of two numbers is 52. Their difference is 6. What are the numbers?

31. A man spent $\frac{2}{3}$ of his money and ₱ 10, and found that he had left ₱ 2 more than $\frac{1}{5}$ of what he had at first. How much had he at first?

32. If 25 % of a certain number be added to 10 % of it, the sum equals 40 % of the number less 24. What is the number?

33. The sum of two numbers is 35. Two times the first plus the second equals 2 times the second minus 5. What are the numbers?

34. Divide ₱ 120 among A, B, and C so that $\frac{1}{3}$ of A's share equals $\frac{1}{4}$ of B's, and equals $\frac{1}{5}$ of C's.

35. A boy lost half of his marbles and 5 more and found that he then had $\frac{5}{12}$ as many as he had at first. How many had he at first?

36. A certain number is decreased by 20 and the remainder is divided by 6. The quotient equals $\frac{1}{4}$ of the original number minus 10. What is the number?

37. What principal will amount to ₱ 885 in 2 years 3 months at 8 %?

38. In how many years will ₱ 600 gain ₱ 133 interest at 7 %?

39. What is the assessed value of a man's property if his total tax, including ₱ 2 cedula tax, is ₱ 50, when the rate is $\frac{3}{4}$ %?

40. An importer paid ₱ 222.75 duty on 22 typewriters at 15 % ad valorem. What did the typewriters cost apiece?

41. I paid ₱ 41.25 premium for insuring my house for $\frac{3}{4}$ of its value at $1\frac{1}{4}$ %. What was the value of the house?

42. Three times the father's age added to $2\frac{1}{2}$ times the son's age is 130 years. If the son is 10 years old, how old is the father?

43. The age of Juan is double the age of José. If 5 be subtracted from Juan's age and 10 be added to José's age, the results will be equal. Find the age of each.

44. A farmer has 55 fowls. He has twice as many chickens as turkeys and five more ducks than chickens. How many of each has he?

45. Rosario is 10 years older than Paz, and 5 years ago Rosario's age was double Paz's. Find the age of each.

46. The sum of two numbers is 80. If to twice the greater 12 be added the result is 4 more than 4 times the smaller. What are the numbers?

47. The sum of the ages of A and B is 50 years. Five years hence A will be 5 times as old as B. Find their ages.

48. Two boys have together 56 marbles. If the boy having the greater number should give the other boy 7 marbles, they would then each have the same number. How many has each boy?

49. A man wishes to divide ₱99 into five parts such that the first part shall be ₱3 more than the second, ₱10 less than the third, ₱9 greater than the fourth, and ₱16 less than the fifth. Find the parts.

50. A man has ₱2800 which he deposits in four banks. He has twice as much in the second bank as in the first, as much in the third as in the first and second, and twice as much in the fourth as in the first and third together. How much money has he in the fourth bank?

51. Find two consecutive numbers such that 5 times the less shall be 61 more than 3 times the greater.

52. Find three consecutive numbers whose sum is 96.

SPANISH TABLES OF MEASURE¹

Length

12 inches	= 1 foot	= .279 m
3 feet	= 1 vara	= .836 m
2 varas	= 1 braza	= 1.672 m

Area

144 square inches	= 1 square foot	= .0776 sq. m
9 square feet	= 1 square vara	= .6987 sq. m
4 square varas	= 1 square braza	= 2.795 sq. m
100 square brazas	= 1 loan	= 279.5 sq. m
10 loans	= 1 balita	= .2795 Ha
10 balitas	= 1 quifion	= 2.795 Ha

Weight

16 ounces	= 1 pound	= 460.09 g
25 pounds	= 1 arroba	= 11.502 Kg
100 pounds	= 1 quintal	= 46.009 Kg
137½ pounds	= 1 picul	= 63.262 Kg
10 taels	= 1 catte	= .6326 Kg
100 cattes	= 1 picul	= 63.262 Kg

Capacity

4 apatans	= 1 chupa	= .375 l
8 chupas	= 1 ganta	= 3 l
25 gantas	= 1 cavan	= 75 l
16 gantas	= 1 tinaja	= 48 l
1 arroba, dry measure,	= 16 l	

Volume

1728 cubic inches	= 1 cubic foot	= .021 cu. m
27 cubic feet	= 1 cubic vara	= .567 cu. m

English Equivalents

1 cm	= .3937 inch	1 l	= .908 quart (dry)
1 m	= 39.37 inches	1 l	= 1.0567 quarts (liq.)
1 Km	= .62137 mile	1 Hl	= 2.8377 bushels
1 sq. m	= 10.764 sq. ft.	1 g	= .0348 ounce (av.)
1 sq. m	= 1.196 sq. yd.	1 Kg	= 2.2046 pounds (av.)
1 Ha	= 2.471 acres	1 M T	= 2204.62 pounds (av.)
1 cu. m	= 1.308 cu. yd.	1 M T	= 1.1023 tons

¹ These tables are given for reference only and should not be confused with the metric tables used throughout the body of the book.

ENGLISH TABLES OF MEASURE

Length

12 inches (in.)	= 1 foot (ft.)	= .3048 m
3 feet	= 1 yard (yd.)	= .9144 m
5½ yards	= 1 rod (rd.)	= 5.0292 m
320 rods	= 1 mile (mi.)	= 1.6093 Km

Area

144 square inches	= 1 square foot	= .0929 sq. m
9 square feet	= 1 square yard	= .8361 sq. m
30½ square yards	= 1 square rod	= .2529 a
160 square rods	= 1 acre	= .4047 Ha
640 acres	= 1 square mile	= 259.008 Ha

Volume

1728 cubic inches	= 1 cubic foot	= .0283 cu. m
27 cubic feet	= 1 cubic yard	= .7646 cu. m

Liquid Measure

4 gills	= 1 pint	= .4732 l
2 pints	= 1 quart	= .9465 l
4 quarts	= 1 gallon	= 3.786 l

Dry Measure

2 pints	= 1 quart	= 1.101 l
8 quarts	= 1 peck	= 8.811 l
4 pecks	= 1 bushel	= .3524 Hl

Avoirdupois Weight

16 ounces (oz.)	= 1 pound (lb.)	= .4536 Kg
100 pounds	= 1 hundredweight (cwt.)	= 45.36 Kg
2000 pounds	= 1 ton (T.)	= 907.18 Kg

Time Measure

60 seconds (sec.)	= 1 minute (min.)
60 minutes	= 1 hour (hr.)
24 hours	= 1 day (da.)
7 days	= 1 week (wk.)
365½ days	= 1 year (yr.)

Miscellaneous Tables

20 units	= 1 score
12 units	= 1 dozen
12 dozen	= 1 gross
24 sheets	= 1 quire
20 quires	= 1 ream

Circular Measure

60 seconds (")	= 1 minute (')	360 degrees	= 1 circumference (cir.)
60 minutes	= 1 degree (°)	90 degrees	= 1 quadrant

ANSWERS

PART II

Page 3

Sec. 3

1. 264,911
2. 320,685
3. 327,263
4. P 3071.26
5. 334,366
6. P 3809.32
7. P 3948.59
8. P 4321.30
9. 64
10. 69
11. 385
12. 518
13. 3922
14. 123,805
15. 817,427
16. P 28.40

Page 5

Sec. 5

1. P 39.25
2. 7874
3. 28,267
4. P 2528.82
5. P 13,882.75
6. P 93,573.55
7. 1069½
8. 83,019½
9. 205,477½
10. 162,474
11. \$50,175.59

12. \$24,469.75

13. P 383.65

14. 1140 m

15. 58½ Km

16. 23,772,056 Ha

17. 5,638,171 Ha

18. 144,233,446
Kg

Page 7

Sec. 7

1. 955,610,898
2. 264,812,340
3. 357,402,640
4. 3,011,200,000
5. P 571,299
6. P 703,088.70
7. P 162,843
8. P 2,123,295.90
9. P 2778.75
10. 1750 Km
11. P 116.38
12. P .79
13. 66,815 Kg
14. P 125.55
15. P 122.50
16. P 484
17. P 5.34

Page 9

Sec. 9

13. 30½
14. 53½

15. 30½

16. 75½

17. 96

18. 75

19. 105½

20. 105½

21. 118½

22. 203½

23. 198

24. 118½

25. 137½

26. 175

27. 755½

28. 1157½

29. 758½

30. 1853½

31. 824½

32. 1194½

33. 1280½

34. 1197½

35. 2499½

36. 2211½

37. 1843½

38. 2561½

39. 126 horses

40. P 85

41. P 780

42. 143½ cavaness

43. 16½ piculs

44. 315 sheep

45. 7½ sec.

46. The latter

Page 10

Sec. 10

1. P 4860
2. P 462
3. P 27
4. 8½ da.
5. P 31.25;
P 137.50;
P 312.50
6. P .70
7. 22½ da.
8. 990 sq. m
9. 4½ cavaness
10. P 60.48
11. 472
12. 305 Km
13. 6½ m
14. 19½ Ha
15. P 97.50
16. P 104.10
17. 25
18. P 1258.40
19. P 10
20. P 3
21. 80 m
22. 35 m
23. P 34

Page 12

Sec. 11

1. 107,882 Kg
2. 23,116 Kg

4. P 3624.45
5. 2,212,451 lb.;
\$990,757

Page 14*Sec. 15*

1. 11
2. 36
3. 24
4. 9
5. 39
6. 64
7. 35
8. 32
9. 28
10. 33
11. 36
12. 25
13. 14
14. 16
15. 27

Page 15*Sec. 17*

1. 120
2. 240
3. 198
4. 225
5. 270
6. 6600
7. 420
8. 216
9. 504
10. 1440
11. 1600
12. 10,080
13. 29,700
14. 19,360
15. 250
16. 144
17. 20,160

18. 8100

Page 16*Sec. 18*

1. $1\frac{1}{2}$
2. 2
3. $2\frac{2}{3}$
4. $\frac{1}{2}$
5. $3\frac{1}{2}$
6. $2\frac{1}{2}$
7. $\frac{1}{4}$
8. $\frac{3}{4}$
9. $\frac{5}{8}$
10. $\frac{7}{8}$
11. $\frac{1}{8}$
12. 6
13. $4\frac{4}{11}$
14. $\frac{3}{4}$
15. $\frac{7}{8}$
16. 1
17. 2
18. $\frac{4}{5}$
19. $2\frac{2}{3}$
20. $4\frac{1}{2}$
21. 27
22. 10
23. $1\frac{1}{2}$
24. $3\frac{1}{2}$
25. $2\frac{2}{3}$
26. $\frac{1}{2}$
27. $\frac{1}{2}$
28. P 11,385
29. P. 25
30. 156 loaves

Page 19*Sec. 25*

2. $1\frac{1}{2}$
3. $1\frac{3}{4}$
4. $2\frac{1}{2}$
5. $1\frac{1}{2}$

6. $1\frac{1}{2}$
7. $1\frac{3}{4}$
8. $2\frac{1}{2}$
9. $2\frac{1}{2}$
10. $2\frac{1}{2}$
11. $2\frac{1}{2}$
12. $2\frac{1}{2}$
13. $4\frac{1}{2}$
14. $2\frac{1}{2}$
15. $2\frac{1}{2}$
16. $2\frac{1}{2}$
17. $2\frac{1}{2}$
18. $2\frac{1}{2}$
19. $2\frac{1}{2}$
20. $2\frac{1}{2}$
21. $2\frac{1}{2}$

Sec. 27

2. $6\frac{1}{2}$
3. $10\frac{1}{2}$
4. $5\frac{1}{2}$
5. $4\frac{1}{2}$
6. $9\frac{1}{2}$
7. $6\frac{1}{2}$
8. $10\frac{1}{2}$
9. $7\frac{1}{2}$
10. $24\frac{1}{2}$
11. $19\frac{1}{2}$
12. $16\frac{1}{2}$
13. $13\frac{1}{2}$
14. $35\frac{1}{2}$
15. $11\frac{1}{2}$
16. $25\frac{1}{2}$
17. $52\frac{1}{2}$
18. $65\frac{1}{2}$
19. $51\frac{1}{2}$
20. $31\frac{1}{2}$
21. $24\frac{1}{2}$
22. $67\frac{1}{2}$
23. $15\frac{1}{2}$

24. $26\frac{1}{2}$
25. $12\frac{1}{2}$

Page 21*Sec. 30*

2. $2\frac{1}{2}$
3. $1\frac{1}{2}$
4. $2\frac{1}{2}$
5. $1\frac{1}{2}$
6. $3\frac{1}{2}$
7. $1\frac{1}{2}$
8. $1\frac{1}{2}$
9. $2\frac{1}{2}$
10. $27\frac{1}{2}$
11. $31\frac{1}{2}$
12. $27\frac{1}{2}$
13. $21\frac{1}{2}$
14. $47\frac{1}{2}$
15. $50\frac{1}{2}$
16. $31\frac{1}{2}$
17. $139\frac{1}{2}$
18. $245\frac{1}{2}$
19. $161\frac{1}{2}$
20. $2522\frac{1}{2}$
21. $2794\frac{1}{2}$
22. $3655\frac{1}{2}$
23. $3618\frac{1}{2}$

Page 22*Sec. 31*

7. $3\frac{1}{2}$
8. $4\frac{1}{2}$
9. $3\frac{1}{2}$
10. $3\frac{1}{2}$
11. $5\frac{1}{2}$
12. $2\frac{1}{2}$
13. $12\frac{1}{2}$
14. $11\frac{1}{2}$
15. $7\frac{1}{2}$
16. $16\frac{1}{2}$
17. $14\frac{1}{2}$

18. $11\frac{1}{4}$
19. $23\frac{1}{4}$
20. $27\frac{1}{4}$
21. $19\frac{1}{4}$
22. $43\frac{3}{10}, 7\frac{7}{10}$
23. $59\frac{3}{10}, 14\frac{4}{10}$
24. $57\frac{1}{10}, 24\frac{7}{10}$
25. $63\frac{3}{10}, 31\frac{1}{10}$
26. $75\frac{1}{10}, 23\frac{1}{10}$
27. $108\frac{3}{10}, 26\frac{3}{10}$
28. $123\frac{3}{10}, 21\frac{1}{10}$
29. $80\frac{4}{10}, 51\frac{1}{10}$
30. $89\frac{1}{10}, 48\frac{1}{10}$
31. $98\frac{1}{10}, 17\frac{1}{10}$
32. $113\frac{1}{10}, 52\frac{1}{10}$
33. $120\frac{1}{10}, 56\frac{1}{10}$
34. $367\frac{1}{10}, 118\frac{3}{10}$
35. $457\frac{1}{10}, 151\frac{1}{10}$
36. $486\frac{3}{10}, 164\frac{3}{10}$
37. $2243\frac{1}{10}, 680\frac{1}{10}$
38. $3930\frac{1}{10}, 884\frac{1}{10}$
39. $5060\frac{1}{10}, 3092\frac{1}{10}$
40. $10,220\frac{1}{10};$
 $1964\frac{1}{10}$
41. $8390\frac{1}{10};$
 $1535\frac{1}{10}$
42. $9671\frac{1}{10};$
 $4383\frac{1}{10}$
43. $13,069\frac{1}{10};$
 $5744\frac{1}{10}$
44. $24,127\frac{1}{10};$
 $9362\frac{1}{10}$

Page 23*Sec. 32*

1. $202\frac{1}{10}$ cm
2. $4\frac{7}{10}$ m
3. $P10\frac{1}{10}$
4. $803\frac{1}{10}$ m
5. $17\frac{1}{10}$ cm

6. $70\frac{1}{10}$ cm long;
 $42\frac{1}{10}$ cm wide
7. $P21\frac{1}{10}$
8. $\frac{1}{10}$
9. $33\frac{3}{10}$ Ha
10. $P3\frac{7}{10}$

Page 24*Sec. 33*

16. $\frac{3}{10}$
17. $\frac{7}{10}$
18. $2\frac{1}{10}$
19. 500
20. 6
21. 2
22. $126\frac{1}{10}$
23. $250\frac{1}{10}$
24. $424\frac{1}{10}$
25. $3334\frac{4}{10}$
26. $5140\frac{1}{10}$
27. $13,199\frac{1}{10}$
28. $853\frac{1}{10}$
29. 1152
30. $2285\frac{1}{10}$
31. 11
32. $4\frac{1}{10}$
33. $\frac{21}{100}$
34. $1\frac{1}{10}$
35. $6\frac{1}{10}$
36. $10\frac{1}{10}$
37. $2\frac{1}{10}$
38. 48
39. $5\frac{1}{10}$
40. 50
41. $9\frac{1}{10}$
42. 120

Page 26*Sec. 35*

1. $516\frac{1}{10}$ Km

2. P8
3. $P30\frac{1}{10}$
4. $P12\frac{1}{10}$
5. $P9\frac{1}{10}$
6. $P78\frac{1}{10}$
7. $P110\frac{1}{10}$
8. $P73\frac{1}{10}$
9. $P46\frac{1}{10}$

Page 27*Sec. 36*

1. $\frac{1}{10}$
2. $\frac{1}{10}$
3. $4\frac{1}{10}$
4. 3
5. 10
6. $2\frac{1}{10}$
7. $2\frac{1}{10}$
8. $3\frac{1}{10}$
9. $3\frac{1}{10}$
10. $3\frac{1}{10}$
11. $37\frac{1}{10}$
12. 16
13. $2\frac{1}{10}$
14. $\frac{1}{10}$
15. $\frac{1}{10}$
16. 6
17. $\frac{1}{10}$
18. $1\frac{1}{10}$
19. $4\frac{1}{10}$
20. 18
21. $2\frac{1}{10}$
22. 1
23. $4\frac{1}{10}$
24. $4\frac{1}{10}$
25. $1\frac{1}{10}$
26. $\frac{1}{10}$
27. $1\frac{1}{10}$
28. $\frac{1}{10}$
29. $1\frac{1}{10}$
30. $\frac{1}{10}$

31. $3\frac{1}{10}$
32. $11\frac{1}{10}$
33. $3\frac{1}{10}$
34. $11\frac{1}{10}$
35. $8\frac{1}{10}$
36. $15\frac{1}{10}$

Page 28*Sec. 38*

1. $\frac{1}{10}$
2. $\frac{1}{10}$
3. $\frac{1}{10}$
4. $\frac{1}{10}$
5. $\frac{1}{10}$
6. $7\frac{1}{10}$
7. $1\frac{1}{10}$ Km;
 $37\frac{1}{10}$ Km
8. 72 books
9. P135
10. $12\frac{1}{10}$ mo.
11. 1660 steps
12. $P12\frac{1}{10}$
13. $P67\frac{1}{10}, P432$
14. 75 bottles
15. 45 ducks

Page 29*Sec. 39*

1. $P8\frac{1}{10}$
2. $P2\frac{1}{10}$
3. $P\frac{1}{10}$
4. $P3\frac{1}{10}$
5. $P\frac{1}{10}$
6. $P\frac{1}{10}$
7. $P\frac{1}{10}$
8. $P\frac{1}{10}$
9. $P\frac{1}{10}$
10. $P1\frac{1}{10}$
11. $P1\frac{1}{10}$
12. $P1\frac{1}{10}$

13. $P 1\frac{1}{2}$
 14. 12 cans
 15. $P 1.12$
 16. $8\frac{1}{2}$ gantas
 17. $P 1\frac{7}{10}$, $P 10\frac{1}{2}$

Page 30

Sec. 40

1. $1\frac{1}{2}$
 2. $\frac{7}{10}$
 3. $\frac{1}{2}$
 4. 14
 5. 40
 6. $\frac{1}{11}$
 7. $\frac{1}{2}$
 8. $2\frac{2}{3}$
 9. $\frac{1}{2}$
 10. $1\frac{1}{15}$
 11. 8
 12. 12
 13. $\frac{11}{12}$
 14. $1\frac{1}{2}$
 15. $\frac{1}{11}$

Sec. 42

1. $\frac{1}{2}$
 2. $\frac{1}{2}$
 3. $\frac{1}{2}$
 4. $\frac{1}{2}$
 5. $\frac{1}{2}$
 6. $\frac{1}{2}$
 7. $\frac{1}{2}$
 8. $\frac{1}{2}$
 9. $\frac{1}{2}$
 10. $\frac{1}{15}$
 11. $\frac{1}{15}$
 12. $\frac{1}{11}$
 13. $\frac{1}{2}$
 14. $\frac{1}{2}$
 15. $\frac{1}{2}$

16. $\frac{1}{2}$
 17. $\frac{1}{2}$
 18. $\frac{1}{2}$
 19. $\frac{1}{14}$
 20. $\frac{1}{15}$
 21. $\frac{1}{17}$
 22. $\frac{1}{2}$
 23. $\frac{1}{2}$
 24. $\frac{1}{10}$
 25. $\frac{1}{2}$
 26. $\frac{1}{2}$
 27. $\frac{1}{10}$
 28. $\frac{1}{11}$

Page 31

Sec. 43

1. 20
 2. 25
 3. 28
 4. 64
 5. 45
 6. 120
 7. 96
 8. 210
 9. 270
 10. 341

Page 32

Sec. 45

1. $19\frac{1}{2}$ gantas
 2. $P 10$, $P 18\frac{1}{2}$
 3. 27 bananas;
 75 bananas
 4. A, $\frac{1}{2}$; B, $\frac{1}{2}$;
 both, $\frac{1}{15}$
 5. $\frac{1}{15}$ centavo
 6. $P 6000$
 7. $P 212\frac{1}{2}$
 8. 12 suits
 9. $P 5.60$

10. $P 82\frac{1}{10}$
 11. $P 6\frac{1}{10}$
 12. $P 75$; $P 30$
 13. $P 6.60$

Page 34

Sec. 48

1. $\frac{1}{2}$
 2. $\frac{1}{2}$
 3. $\frac{1}{10}$
 4. $\frac{1}{2}$
 5. $\frac{1}{2}$
 6. $\frac{1}{10}$
 7. $\frac{11}{2000}$
 8. $\frac{1}{1000}$
 9. $\frac{1}{10}$
 10. $\frac{1}{10000}$
 11. $\frac{1}{10000}$
 12. $\frac{1}{10000}$
 13. $\frac{1}{100000}$
 14. $\frac{1}{100000}$
 15. $\frac{1}{1000}$
 16. $\frac{1}{10}$
 17. $\frac{1}{2}$
 18. $\frac{1}{2}$
 19. $\frac{1}{2}$
 20. $\frac{1}{2}$
 21. $\frac{1}{2}$
 22. $\frac{1}{2}$
 23. $\frac{1}{10}$
 24. $\frac{1}{10}$
 25. $\frac{1}{10}$
 26. $\frac{1}{2}$
 27. $\frac{1}{2}$
 28. $\frac{1}{10}$
 29. $\frac{11}{111}$
 30. $\frac{1}{11}$
 31. $\frac{1111}{1000}$
 32. .8
 33. .75
 34. .35

35. .125
 36. .625
 37. .24
 38. .55
 39. .625
 40. .875
 41. .625
 42. 2.15
 43. 5.05
 44. 8.08
 45. 11.14
 46. 6.225
 47. .331
 48. .161
 49. .661
 50. .831
 51. .375
 52. .411
 53. .551
 54. .531
 55. .64
 56. .231

Page 35

Sec. 49

1. 626.634
 2. 727.4288
 3. 1752.0242
 4. 788.9657
 5. 1565.0691
 6. $P 403.33$
 7. $P 703.46$
 8. $P 288.22$
 9. $P 550.01$
 10. \$844.75
 11. \$692.78
 12. $P 282.60$
 13. $P 275.24$
 14. $P 315.88$
 15. $P 36.25$
 16. 57.867

17. 17.308
18. 265.156
19. 77.3746
20. 18.65
21. 48.37
22. 68.55
23. 203.628
24. 349.13
25. 6.8754
26. 9.093
27. 190.992
28. 330.1979
29. 86.0118
30. 183.927
31. 240.556
32. 83.617
33. P 90.08
34. P 81.66
35. \$131.40
36. P 3.15
37. P 7.05

Page 37*Sec. 50*

1. 17.241
2. .74
3. 156.75
4. 37.215
5. .3616
6. .01816
7. 9.1701
8. .6695
9. 227.625
10. 9.4754
11. .7725
12. 3.5154
13. 17.446
14. 718.574
15. 3.625
16. 2400
17. .662088

18. 34.7645
19. 20
20. .0066994
21. .00775
22. 60
23. .00000408
24. .000806
25. P 3.57
26. P 70.61
27. 94.488 in. ;
228.346 in.
28. P 16.36
29. P 1963.50
30. 363.375 Km ;
538.65 Km

Page 39*Sec. 53*

1. 2.35
2. .353
3. 4.071
4. 31.6
5. 14.55
6. 1246
7. 30.2
8. 40.7
9. 332.5
10. .8
11. .618
12. .68
13. 250
14. 41.2
15. 2500
16. 8.34
17. .017
18. 325
19. 225,000
20. .0625
21. 2.75
22. 51.33 $\frac{1}{2}$
23. 1.117

24. .046
25. .1357
26. 3.5265
27. .00115
28. .325
29. 3.25
30. .0325

Sec. 54

2. 116 pictures
3. 31 books
4. 264 rakes
5. 24 m, 112 m
6. 63 Kg, 95 Kg
7. 16 chairs
8. 33 pieces ;
95 pieces
9. 37 umbrellas ;
47 umbrellas

Page 41*Sec. 57*

1. P 364.10
2. P 43.20
3. P .35
4. P 9.85
5. P 429
6. 18 chairs ;
45 chairs
7. 360 hats
8. 14.4 cavaness
9. 48.4 Km
10. 12.4 cu. m
11. 195 Km
12. P 47.70
13. 4.8 tons
14. P 637 ;
P 1081.50 ;
P 1484
15. 10.29952 Km
16. P 1.10

17. P 39.05
18. P .50
19. P 180.30
20. 8.8 m
21. 5.2 da.
22. 32 weeks

Page 43*Sec. 58*

1. 4437.19931
2. 10,146.06203
3. 18,605.4246
4. 2032.33974
5. 39,345.42456
6. 6680.1335
7. 38,420.2487
8. 2400.472519
9. 588.533
10. 2045.783
11. 119,940.978
12. .036754
13. 6.55062
14. 86.82373
15. 437.9955
16. 3799.9962
17. 1748.0913
18. 3453.1076
19. 22.50225
20. 7.64705
21. 395.564
22. 25,363.0276
23. 53.5
24. 245.25
25. 4098
26. 279.4
27. 311.6
28. 2.98968
29. 2.95091
30. 5272.5
31. 444.85
32. 6052.5

33. 943.488
 34. 35.8
 35. 755.1
 36. 17.444
 37. 714.7
 38. 136
 39. 192
 40. 440
 41. 77.2
 42. 69.3
 43. 264
 44. 37.6
 45. 5.48
 46. 425.6
 47. 15.02
 48. 220.8
 49. 130
 50. 345.6
 51. 151.5
 52. 90.9

Page 45*Sec. 59*

1. ₱19.60
 2. ₱79.75
 3. ₱31
 4. ₱73.50
 5. ₱9.11
 6. ₱32.97
 7. ₱35.70
 8. ₱59.25

Page 46*Sec. 60*

1. ₱50.20
 2. ₱88.85
 3. ₱90

Page 49*Sec. 63*

17. 452.47 m

18. 168.081 m
 19. 4097.8265 m
 20. 72.725 m
 21. 582.983 m
 22. 206.735 m
 23. 6.35 m, 306 m,
 185.85 m
 24. 2.025 m;
 14.2 m
 25. 116.28 m;
 986 m
 26. 43.68 m; 370
 m
 27. .25, .625
 28. 575, .0472

Page 50*Sec. 64*

1. ₱82.12½
 2. ₱6.76
 3. ₱1,261,125
 4. 52.5 Km
 5. ₱33.77
 6. 83.3 Km
 7. ₱21.14
 8. 95 Km
 9. 35½ m
 10. 144.9 m
 11. ₱10.71
 12. 22 m

Page 52*Sec. 66*

6. 49.5 sq. m
 7. ₱4200
 8. 75 cm
 9. 1302 tiles
 10. 10,080 sq. cm
 11. 8400 bricks;
 ₱138.60

Page 53*Sec. 67*

3. 5.2 Ha;
 34.09 Ha;
 5.8355 Ha
 4. ₱75.30
 5. ₱1530
 6. ₱2077
 7. 22.5 Ha
 8. 2400 sq. m
 9. ₱2070
 10. ₱1237.50
 11. 61.775 acres;
 37 Ha
 12. 400 m

Page 54*Sec. 68*

1. 2.56 Ha
 2. M, .32 Ha;
 H, .64 Ha;
 T, .32 Ha;
 R, .72 Ha;
 Z, .48 Ha;
 G, .08 Ha
 4. A, .09 Ha;
 B, .48 Ha;
 C, .2 Ha;
 Whole, .77 Ha
 5. D, .275 Ha;
 E, .88 Ha;
 F, .275 Ha;
 Whole, 1.43
 Ha

Page 56*Sec. 70*

1. 1700 cu. cm;
 1.7 cu. dm

2. 63,000 cu. cm;
 63 cu. dm
 3. 1710 cu. m
 4. ₱435.24
 5. ₱148.50
 6. 2.475 cu. m
 7. 24 cu. m
 8. ₱367.36
 9. 369.6 cu. m
 10. 5.76 cu. m
 11. ₱308.70
 12. ₱108
 13. ₱132.30

Page 57*Sec. 71*

4. 2880 l;
 28.8 Hl
 5. 24 Hl
 6. ₱35.84
 7. 61 cm
 8. 147 bottles

Page 58*Sec. 72*

5. 201.6 Kg
 6. ₱11.70
 7. 249.855 Kg

Page 59*Sec. 73*

2. 4.536 Kg
 3. 3.4 Kg
 4. 110.4 Kg
 5. 11.808 Kg
 6. 1.02
 7. .825
 8. 259.2 Kg
 9. 150,000 cu. cm

10. 10.5

11. 32.4 Kg

12. 25 l

Page 60*Sec. 74*

1. 3060 cu. m ;

1122 MT

2. 100 loads

3. ₦ 719.28

4. ₦ 875

5. 28.08 Hl

6. 576 Kg

7. ₦ 23.52

8. 3696 bricks

9. ₦ 31.25

10. ₦ 88.32

11. 40 cm

12. 8 hr. 15 min.

13. ₦ 2.25

14. 202.5 l

15. 2.4

16. 12.84 sq. m

17. 5875 Kg

18. 30 l, 300 MT

19. 280.8 Kg

20. 34.4 l

21. 1800 cu. m

22. 160 m; ₦ 55.30

23. 45 Hl

24. 270 Kg

Page 62*Sec. 75*

1. ₦ 838.08

2. ₦ 1543.50

3. ₦ 294.46 ;

₦ 5470.79

4. 34,559,943 Kg

5. 2,223,862,765

Kg ;

88,009,371 Kg

6. 1200 seeds

Page 63*Sec. 76*

1. ₦ 3.60

2. A, 54 Ha ;

B, 36 Ha

3. 306 piculs

4. ₦ 29.55

5. 14½

6. 47½ Ha

7. 37½ Ha

8. ₦ 27,360

9. The second ;

₦ 340

Page 65*Sec. 79*

1. 17,940 min.

2. 540,048 sec.

3. 372,420 sec.

4. 50,628 min.

5. 34,560 min.

6. 32,400 sec.

7. 468 min.

8. 259,920 sec.

9. 3 da. 9 hr. 59

min. 38 sec.

10. 2 wk. 6 da. 45

min. 5½ sec.

11. 4 wk. 13 hr.

26 min.

12. 378,000 sec.

13. ½

14. ¼

15. ⅓

16. 3¼ min.

Page 66*Sec. 80*

1. 56 yr. 2 mo.

29 da.

2. 57 da. 14 hr.

35 min. 28 sec.

3. 29 wk. 3 da.

14 hr. 3 min.

4. 54 min. past

2 p.m.

5. 9 min. past 10

Page 67*Sec. 81*

1. 27 yr. 7 mo.

25 da.

2. 3 da. 17 hr. 25

min. 12 sec.

3. 83 yr. 6 mo. 8

da.

4. 44 min. 36 sec.

past 9 p.m.

5. 12 yr. 6 mo.

17 da.

6. 19 yr. 5 mo.

13 da.

7. 30 yr. 8 mo.

17 da.

8. 68 yr. 6 mo.

17 da.

11. 67 yr. 9 mo.

22 da.

12. 161 da.

13. 121 da.

14. 182 da.

15. 169 da.

Page 68*Sec. 82*

1. 35 wk. 2 da. 3

hr.

2. 124 yr. 7 mo.

3. 35 wk. 1 da.

23 hr. 20 min.

4. 5 da. 6 hr. 20

min. 30 sec.

5. 680 yr. 8 mo.

10 da.

6. 6 da. 17 hr. 36

min. 45 sec.

7. 3 da. 20 hr. 29

min. 30 sec.

8. 91 wk. 6 da.

12 hr.

9. 11 wk. 4 da.

1 hr. 14 min.

15 sec.

10. 3100 copies

Page 69*Sec. 83*

1. 8 hr. 15 min.

32 sec.

2. 14 yr. 1 mo.

19 da.

3. 4 hr. 18 min.

45 sec.

4. 15 hr. 18 min.

54½ sec.

5. 6 wk. 3 da. 22

hr.

6. 10 hr. 9 min.

22 sec.

7. 10 wk. 3 da. 9

hr. 30 min.

8. 6 yr. 8 mo. 25

da.

9. ₦ 3.33

Page 73*Sec. 87*

1. 8 hr. 3 min.

50 sec.

2. 6 hr. 1 min.

47 sec.

3. 2 hr. 19 min.

16 sec.

4. 8 hr. 25 min.

23 sec.

- | | | | |
|---|--|----------------------------------|----------------------------------|
| 5. 4 hr. 53 min.
37 sec. | Page 76
<i>Sec. 90</i> | 16. $6\frac{1}{2}$ sq. cm | 9. ₱102.60 |
| 6. 1 hr. 15 min.
8 sec. | 11. ₱533.75 | 17. 15 sq. cm | 10. ₱152.01 |
| 7. 10 min. 15 sec.
past 7 p.m. | 12. 88 cm | 18. $11\frac{1}{2}$ sq. cm | 11. ₱135 |
| 8. 2 min. 39 sec.
past 2 p.m. | 13. ₱1620 | 19. $19\frac{1}{2}$ sq. cm | 12. ₱101 $\frac{1}{2}$ |
| 9. 22 min. 9 sec.
past 10 a.m. | 14. 160 m | 20. $13\frac{1}{2}$ sq. cm | 13. 60.655 |
| 10. 56 min. 12 sec.
past 10 a.m. | Page 77
<i>Sec. 91</i> | 21. 17.64 sq. cm | Page 85
<i>Sec. 98</i> |
| 11. 48 min. 56 sec.
past 9 a.m. | 6. 1.86 Ha | 22. $108\frac{1}{2}$ sq. cm | 1. 25.5 bbl. of
cement; |
| 12. 48 min. 43 sec.
past 5 p.m. | 7. ₱130.50 | Page 80
<i>Sec. 93</i> | 5.1 cu. m of
sand; |
| 13. 32 min. 34 sec.
past 2 p.m. | 8. 1.353 Ha | 1. ₱1.25 | 10.2 cu. m of
stone |
| Page 74
<i>Sec. 83</i> | 9. 1.89 sq. m | 2. ₱4.30 | 2. ₱209.10 |
| 1. 12° 29' E. | 10. 42.5 m | 3. ₱22.20 | 3. 2.925 cu. m of
sand; |
| 2. 37° 34' 15" E. | Page 78
<i>Sec. 92</i> | 4. ₱68.85 | 5.85 cu. m of
stone; |
| 3. 16° 20' 15" E. | 1. A, .54 Ha; | Page 81
<i>Sec. 94</i> | 14.625 bbl. of
cement; |
| 4. 120° 57' 30" E. | B, 1.2 Ha; | 1. 2475 nipas; | ₱146.25 |
| 5. 37° 34' 15" E. | C, .705 Ha; | ₱10.89 | 4. ₱324 |
| 6. 90° 12' 15" W. | D, .435 Ha | 2. ₱5.94 | 5. 63 barrels |
| 7. 1 hr. 15 min.
8 sec. too fast | 3. A, ₱43.20 | 3. ₱3.84 | 6. 46 cu. m |
| 8. 17 min. 15 sec.
past 1 p.m. | B, ₱96; | 4. ₱23.31 | 7. ₱136 |
| 9. 13 min. 33 sec.
past 4 a.m.
Jan. 2 | C, ₱56.40; | 5. ₱26.40 | 8. 288 blocks |
| 10. 32 min. 25 sec.
past 4 p.m. | D, ₱34.80 | Page 82
<i>Sec. 95</i> | 9. ₱1012.50 |
| 11. 37° 34' 15" | 4. ₱133.80 | 1. 22 sheets | Page 86
<i>Sec. 99</i> |
| 12. 47 min. 48 sec.
past 11 p.m. | 5. 160 m | 2. 42 sheets | 1. 19,000 T |
| 13. 77° 4' W. | 6. ₱330.60 | 3. ₱76.69 | 2. 66 da.; |
| 14. 120° 57' 30" | 7. ₱29.25 | 4. 1624 Kg | ₱39,251.52 |
| 15. 13° 23' 45" | 8. ₱20.55 | 5. 130 pieces | 3. 9000 bricks |
| | 9. 200 m by
600 m; | 6. 17 sheets | 4. 11,000 stones; |
| | ₱9000 | Page 84
<i>Sec. 97</i> | ₱935 |
| | 10. 928 tiles; | 1. 360 ft. | 5. ₱529.20 |
| | ₱64.96 | 2. 644 ft. | 6. 13,500 bricks |
| | 11. 44 m | 3. 637 ft. | 7. 250 cu. m |
| | 12. 1200 sq. cm | 4. 1728 ft. | 8. 960 stones; |
| | 13. 115 sq. m | 5. 2424 ft. | ₱115.20 |
| | 14. 270 tiles; 5
rows; 1350
tiles; ₱81 | 6. 2592 ft. | |
| | 15. 8760 sq. m | 7. 1728 ft. | |
| | | 8. 1125 ft. | |

9. P 210
10. P 630
11. P 11,100
12. P 1375.85

Page 87*Sec. 100*

1. P 108
2. 39.30
3. 210 ft. B.M.
4. P 65.85
5. P 22.44
6. 625.6 Kg
7. 148 ft.
8. 15.2 Hl
9. 17.92 sq. m
10. 1425 Kg
11. P 164.56
12. P 18
13. P 228.66
14. P 26.46
15. 375 m
16. 661.5 sq. cm;
1157.025 cu.
cm
17. 26 m
18. 126.72 sq. m
19. 1512 Kg
20. 15 ft.
21. 66.56 MT
22. P 84.87
23. P 16.67
24. 21,500 Hl

Page 92*Sec. 104*

13. 96 Kg
14. P 85.35
15. 6 pupils
16. 1st, 300 Hl;

- 2d, 262.5 Hl;
3d, 187.5 Hl
17. P 176, P 144
18. P 102.85
19. P 185.25

Page 94*Sec. 106*

1. $33\frac{1}{3}\%$
2. 25%
3. $66\frac{2}{3}\%$
4. 40%
5. 55%
6. 30%
7. $37\frac{1}{2}\%$
8. 24%
9. 25%
10. $62\frac{1}{2}\%$
11. 25%
12. 80%
13. 4% , $2\frac{1}{2}\%$
14. 5% , 8%
15. 70%
16. $1\frac{1}{3}\%$, $8\frac{1}{3}\%$
17. 95% , 45%
18. $2\frac{1}{2}\%$
19. 40% , 60%
20. 30%

Page 95*Sec. 108*

1. 625
2. 780
3. 360
4. 780
5. 250
6. 1070
7. 440
8. 968
9. 124

10. 480
11. 6200
12. 84
13. 1600
14. 132
15. 100
16. 2106
17. 16.88
18. 2000
19. .6
20. 600
21. 660
22. P 34
23. P 5600
24. P 104.50
25. P 5.50
26. P 115, P 134.55
27. P 32,568,000

Page 97*Sec. 110*

1. 610
2. 440
3. 540
4. 504
5. 350
6. 560
7. 1200
8. 580
9. 630
10. 340
11. 536
12. 650
13. 280
14. P 850
15. P 2250
16. P 10.50
17. 4650
18. 348 pupils
19. P 125

Page 99*Sec. 112*

1. 940
2. 460
3. 750
4. 840
5. 425
6. 375
7. 3090
8. 127.5
9. 325
10. 800
11. 164
12. P 850
13. 650 pupils
14. 75 Kg
15. P 44
16. P 7.25
17. 653,720
18. P 6270
19. P 4509
20. P 31

Page 101*Sec. 114*

1. P 33.60
2. $16\frac{2}{3}\%$
3. P 1650
4. 20%
5. P 261.90;
P 1716.90
6. P 1150
7. 68 chickens
8. 50%
9. P 9317
10. Gained P 70
11. 20%
12. P 72
13. P 2.75
14. P 865
15. $12\frac{1}{2}\%$

16. 4250 coconuts
17. $12\frac{1}{2}\%$
18. P.24
19. P74,980
20. P303.75
21. $37\frac{1}{2}\%$
22. P35
23. P33, $16\frac{2}{3}\%$

Page 103*Sec. 116*

1. P64
2. P40.50
3. P391.23
4. 4%
5. P476
6. P357.67
7. P13.30;
P266.70
8. P118.58
9. $4\frac{1}{2}\%$
10. 5%
11. 28 carabaos
12. P960
13. P41
14. P175.50
15. P112
16. 500 tons.
17. 80 Ha

Page 106*Sec. 118*

1. P765
2. P642.60
3. P752.50
4. P8.40
5. P291.60
6. P3343.05
7. P541.50
8. 20%
9. The former;
P6

10. P1009.25
11. 31.6%
12. $16\frac{2}{3}\%$
13. The former;
P4.75
14. P230.37

Page 108*Sec. 120*

1. P81
2. P84.86
3. P35.65
4. P7626
5. 251,460 Kg
6. P2554.15
7. 4250
8. 310,489 gross
9. P12,650
10. P48,756
11. P43.47

Page 109*Sec. 122*

1. P47.50
2. P1714.60
3. P17.30
4. P209.30
5. P1107.45
6. P15.25
7. P7530
8. P6.18
9. P616.36
10. P124
11. P195.30
12. P292.23
13. P54.40

Page 112*Sec. 125*

1. P200
2. P27

3. P6840
4. $\frac{3}{4}\%$
5. P7500
6. P2400
7. P1046.25
8. $2\frac{1}{4}\%$
9. P3285
10. House P6000;
Mill P8000

Page 113*Sec. 126*

1. P111.52
2. P265.60
3. P704.30
4. P5984.56
5. P1810.20

Page 115*Sec. 128*

1. P11.20
2. P204.60
3. P262.35
4. P1.89
5. P538.74
6. P47.71
7. P270.30
8. P202.40
9. P58.88
10. P118.89
11. P469.55
12. P1512.23
13. P1257.57
14. P4412.68
15. P87.33
16. P536.88
17. P3906.90
18. P20.98
19. P49.59
20. P372
21. P882.12

22. P537.24
23. P884.69
24. P1357.68
25. P731.14
26. P23.78
27. P22.48
28. P12.20
29. P14.40

Page 117*Sec. 129*

1. P126.04
2. P158.01
3. P77.78
4. P20.98
5. P66.40
6. P171.35
7. P231.88
8. P119.48
9. P16.07
10. P52.92
11. P58.13
12. P249.01
13. P108.08
14. P125.79
15. P240.04
16. P92.83

Page 118*Sec. 130*

1. P2.40
2. P3.30
3. P5.58
4. P12.60
5. P.61
6. P4.11
7. P11.56
8. P1.76
9. P16.11
10. P10.36
11. P7.30

12. P 13.15;
June 9
13. P 12, Mar. 22
14. P 88.77;
Aug. 13
15. P 65.75;
Feb. 4, 1908
16. P 49.32;
Feb. 13, 1908
17. P 328.77;
June 25
18. P 720, May 31

Page 119*Sec. 131*

1. 6% 7. 5%
2. 7% 8. 12%
3. 5% 9. 10%
4. 4% 10. 9%
5. $6\frac{1}{2}\%$ 11. 10%
6. 8% 12. 6%

Page 120*Sec. 132*

1. 2 yr. 2 mo.
2. 3 yr. 3 mo.
3. 4 yr. 2 mo.
15 da.
4. 2 yr. 8 mo.
10 da.
5. 2 yr. 9 mo.
9 da.
6. 3 yr. 1 mo.
15 da.
7. 7 mo. 14 da.
8. 3 yr. 7 mo.
6 da.
9. 6 yr. 3 mo.
10. 10 yr.;
8 yr. 4 mo.
11. 25 yr.

12. 2 yr. 10 mo.
12 da.
13. Sept. 25, 1908

Page 121*Sec. 133*

1. P 50
2. P 220
3. P 820
4. P 385
5. P 2680
6. P 1500
7. P 4560
8. P 150
9. P 1080
10. P 2000
11. P 980
12. P 320
13. P 600
14. P 250

Page 125*Sec. 136*

1. P 1524.08
2. P 192.53
3. P 269.15
4. P 341.30
5. P 220.80
6. P 169.25
7. P 1762.85

Page 126*Sec. 137*

1. P 469.33
2. P 374.52
3. P 2511.11
4. P 828.84
5. P 1302.40
6. P 78.06

7. P 217.93
8. P 47.78

Page 128*Sec. 138*

1. July 31; 30
da.; P 1985.21
2. June 9; 30 da.;
P 1486.67
3. Oct. 20; 20
da.; P 795.55
4. Aug. 30; 49
da.; P 7082.40
5. Dec. 1; 77 da.;
P 3628.69
6. Aug. 1; 61
da.; P 845.17
7. June 12; 72
da.; P 4507.38
8. July 10; 10 da.;
P 12,046.44
9. Feb. 20; 50
da.; P 361.96
10. Nov. 1; 61 da.;
P 4932.23

Page 131*Sec. 140*

1. P 538.45
2. P 768,906.25
3. P 538.13
4. P 6.88
5. P 913.65
6. P 806.19
7. P 770.94
8. P 707.25
9. P 156.12
10. P 529.22

Page 137*Sec. 142*

1. 215.3112
2. .001182
3. $\frac{1}{4}$
4. P 1104 $\frac{1}{2}$
5. 11.25 Hl
6. P .15; $4\frac{1}{2}\%$
7. 24 $\frac{1}{2}$ Q
8. $4\frac{1}{2}$ da.
9. 180 m
10. 32 $\frac{1}{2}$ Q
11. 1620 l
12. P 8703.75
13. 630 Kg
14. .82
15. 2550 bottles
16. P 2750
17. P 25.50
18. 160
19. $\frac{1}{4}$ Hl.
20. P 7200
21. 25 pigs
22. P 8.81
23. All, 8 da.;
A, 24; B, 17 $\frac{1}{2}$;
C, 40
24. 42 wk.
25. 60 l
26. 2016 Kg
27. P 9000

Page 139*Sec. 143*

1. 3.9 MT
2. 62.8 m
3. P 156.80
4. P 115.20

5. 3045 ft.
6. 70 MT
7. P 506.88
8. 34 sheets
9. P 86.19
10. 9152 Kg
11. P 40.72
12. P 283.50
13. P 97.61
14. $14\frac{1}{2}$ sec.
15. P 6.08
16. P 577.50
17. 399 sq. m
18. $\frac{1}{2}$ sec.
19. P 93.75
20. $3\frac{1}{2}$ min.
21. Younger, P 928;
Elder, P 2552

Page 141

Sec. 144

1. P 7500
2. P 61.50
3. 25%
4. P 230
5. P 12,145
6. 55%
7. P 10,000
8. P 16.50
9. 50%
10. P 550
11. $12\frac{1}{2}$ %
12. 20%
13. P 81.55
14. P 32
15. 45%
16. 63 l
17. $22\frac{2}{3}$ %
18. P 405
19. $37\frac{1}{2}$ %

20. P 15.20
21. $31\frac{1}{2}$ %
22. $33\frac{1}{3}$ %
23. P 750
24. $87\frac{1}{2}$ %

Page 143

Sec. 145

1. P 1250
2. P 362.50
3. 74.25 l
4. P 5000
5. P 40
6. P 54.40, 17%
7. P 1200
8. P 2400
9. 300 da.
10. $16\frac{2}{3}$ %
11. $9\frac{1}{11}$ %
12. $12\frac{1}{2}$ %
13. House, P 1400;
Lot, P 1750
14. P 152.62
15. P 6
16. P 50
17. $12\frac{1}{2}$ %
18. P 4800
19. P 60; P 90
20. P 500
21. P 275
22. $33\frac{1}{3}$ %
23. P 1000

Page 145

Sec. 146

1. P 700
2. P 27.90
3. Schools, $\frac{1}{4}$ %;
Mun. ex., $\frac{1}{3}$ %;
Prov. ex., $\frac{1}{3}$ %
4. P 80,525,236

5. 200 HI
6. P 16.50
7. P 2541.60
8. Aug. 21, 1909;
P 263.90
10. P 450
11. P 250
12. 10%
13. P 330.03
14. P 840
15. 6%
16. 3 yr. 6 mo. 24
da.
17. P 1500
18. P 2539.33
19. P 655.26
20. P 3720
21. 7%
22. 2 yr. 5 mo. 15
da.
23. P 797.01
24. P 152, $12\frac{1}{2}$ %
25. Lost P 40
26. P 400
27. 6%
28. P 21.30
29. P 307.29
30. P 37,500
31. P 1000
32. P 551.91
33. P 1080
34. P 449.04
35. P 88
36. P 2034.25
37. P 474.95

Page 148

Sec. 147

1. 25%
2. 180 Q

3. P 307.80
4. P 4.25
5. P 5250
6. P 640
7. P 2.34
8. P 87.40
9. $\frac{1}{16}$ MT
10. 7%
1. 2 yr. 2 mo. 15
da.
2. P 720
3. 44 da.;
P 1451.20
4. P 455
5. 340
6. $11\frac{1}{2}$ %
7. P 61.88
8. P 9840
9. $1254\frac{1}{2}$ Q
10. P 976
1. P 26.78
2. P 96.80
3. 25%
4. P 277.20
5. 56 horses
6. First; P 6
7. P 485.65
8. $2\frac{1}{2}$ da.
9. 2 yr. 9 mo.
10. 70 HI
1. P 875
2. P 3888
3. $\frac{1}{4}$
4. 3720
5. 12 da.
6. $\frac{2}{5}$
7. 202 Q
8. P 870.40
9. 9%
10. 3 yr. 1 mo. 24
da.

PART III

Page 158*Sec. 3*

1. 669.6 ;
288.4 ;
642
2. 825
3. 164
4. 2082
5. $7\frac{1}{2}\%$
6. 45%
7. 63.7
8. 75%
9. 78 years
10. P84,000
11. P26,250
12. P25,600
13. $33\frac{1}{3}\%$
14. P2.72
15. P45.85
16. $10\frac{1}{4}$
17. $1\frac{1}{2}$
18. P1296
19. P3300
20. P23.25
21. $2338\frac{1}{2}$ bd. ft.
22. P14.18
23. 1008 Kg
24. 850 tiles
25. 20 hours
26. P8.90
27. P52
28. P200
29. 24 piculs

Page 160*Sec. 4*

1. P64
2. Cacao, P286 ;
Coffee, P200

3. P24**4. P12.50****5. P1206****6. 25%****7. 4270 Km****8. Ten and one
one-hundredth****9. 5000 pounds
sterling****10. 61 cu. cm****11. 16,680 sq. cm ;
65.2 dm****12. P10,240****13. P20****14. 128 marbles****15. P168.75****16. 775.2 g****17. 20%****18. Lost P20****19. $2\frac{1}{2}\%$** **20. P440****21. 288 bales****22. $\frac{1}{8}\%$** **23. 3 yr. 4 mo.
15 da.****24. P750****25. P156.08****26. 25%****Page 163***Sec. 6*

1. 7500 shares
2. P660
3. P180
4. P87.50
5. P240
6. $2\frac{1}{4}\%$
7. 100 shares
8. P5400

9. P3150**10. P1926****11. P6562.50****12. $7\frac{1}{4}\%$** **13. P560****14. 56 shares****16. P2155****17. P350****18. 40 shares****19. P230****20. P6075****21. P10,530****22. $7\frac{1}{4}\%$** **23. P80****24. $51\frac{1}{4}\%$** **25. P490****26. P765****27. 8%****28. 5%****29. $7\frac{1}{2}\%$** **30. P104,000****31. 123 $\frac{1}{2}$** **32. P12,632.50****33. 75****34. 210 shares****35. 330 shares****36. P17,020****37. $8\frac{1}{4}\%$** **38. 86 shares ;
P473****39. The latter****40. $\frac{1}{4}\%$** **Page 166***Sec. 7*

1. P615.50
2. P1000
3. P350 ;
P21

4. P14.40**5. The latter,
P100****6. P300****7. The interest,
P17.61****8. The latter****9. P107.28****10. P9.60****11. P.13****12. P166.67****13. P1600****Page 167***Sec. 8*

1. P2.38 ;
P497.62
2. P7.40 ;
P1992.60
3. P7.40 ;
P2492.60
4. P20.71 ;
P3579.19
5. P360 ;
P14.40
6. P450 ;
P54
7. P1250 ;
P312.50
8. P877.19 ;
P122.81
9. P735.29 ;
P14.71

Page 169*Sec. 10*

1. 45 ; 75
2. 160 ; 200
3. P758 ;
P4169

4. 6 dm;
24 dm
5. A, P 1440;
B, P 960
6. P 6.50;
P 7.80
7. 6 to 1;
5 failed
8. 14 Kg silk;
35 Kg abacá.

Page 172

Sec. 12

1. P 96
2. 240 Km
3. 20 days
4. P 464.94
5. 20 piculs
6. 6 days
7. 42 days
8. 24 men
9. 55 m
10. 150 Km
11. P 31.25;
P 150
12. P 5265;
P 2295
13. 12 m
14. $7\frac{1}{2}$ days
15. P 48
16. P 49
17. 112 days
18. 44 days
19. $3\frac{1}{2}$ years
20. P 11.96
21. P 10.50
22. $43\frac{1}{2}$ tons
23. P 56.25
24. P 13,500
25. $\frac{9}{16}$ cu. m

26. 124 cu. cm
27. 1250 sq. m

Page 175

Sec. 14

1. A, P 1000;
B, P 1200
2. A, P 1680;
B, P 3920;
C, P 2800
3. A, P 2016;
B, P 3024
4. A, P 700;
B, P 500;
C, P 300
5. A, P 1920;
B, P 2560;
C, P 1920
6. A, P 420;
B, P 525;
C, P 630
7. A, P 1800;
B, P 1800
8. A, P 2070;
B, P 1680
9. A, P 840;
B, P 60;
C, P 180

Page 179

Sec. 16

1. P 540
2. 37,760.22 Ha
3. P 68.75
4. P 1260
5. 22 yr. 2 mo.
20 da.;
20 yr.;
13 yr. 4 mo.

6. A, P 960;
B, P 660
7. P 16,800
8. $2\frac{1}{2}$ days
9. 19,824
10. P 780
11. 125 m
12. 9 sq. m
13. 20 days
14. P 420
15. A, P 46.25;
B, P 55.50;
C, P 64.75
16. 30 days
17. A, P 1386;
B, P 1584;
C, P 1584
18. P 596.70
19. 150%;
20%
20. P 41,250
21. P .78
22. 8%
23. P 6775
24. P 587.26
25. 70 men
26. P 87.38
27. P 2292.50
28. P 158.40
29. P 1312.50
30. 168 bonds
31. $108\frac{1}{2}$
32. Increased,
P 27.60
33. P 980;
 $3\frac{1}{2}\%$
34. $7\frac{1}{3}\%$
35. A, 1715 pi-
culs;
B, 2205 pi-
culs;

- C, 245 piculs
36. 28 cavanés
37. P 815
38. 20 Ha
39. $155\frac{1}{2}$ cavanés
40. 1875 cavanés
41. P 6.56
42. P 5.50
43. $31\frac{1}{2}$ Ha
44. P 47.54
45. $\frac{1}{2}$ ft.
46. 44.68 cu. m
cement;
223.4 cu. m
gravel;
89.36 cu. m
sand
47. 1.34 m
48. 384 ft. B. M.
49. $283\frac{1}{2}$
50. P 2000
51. P 1840
52. A, P 1410;
B, P 1974;
C, P 846
53. A, P 120.45;
B, P 240.90;
C, P 602.25
54. José, P 32;
Pedro, P 27
55. Lost P 2
56. P 921.60
57. P 180;
P 225
58. P 48
59. Lost 4%
60. 2%
61. P 2500
62. 1250 m
63. The first;
P 2.35

64. P 1.22
 65. P 2072
 66. P 6800
 67. 80 years
 68. P 1158
 69. Dec. 6, 1911
 70. P 6310

Page 185*Sec. 17*

1. P 2
 2. 150%
 3. $\frac{1}{2}$ skein
 4. 92%
 5. 2 pairs
 6. $27\frac{1}{2}\%$
 7. José, $45\frac{5}{11}\%$;
 Segundo,
 $54\frac{6}{11}\%$
 8. Slippers,
 $266\frac{2}{3}\%$;
 Basket, 225%
 9. $87\frac{1}{2}\%$;
 P 47
 10. P 3.48
 11. $54\frac{8}{11}\%$
 12. P 2.80
 13. $53\frac{1}{2}\%$
 14. $24\frac{1}{2}\%$
 15. 10%
 16. P 9
 17. P 6.30
 18. P 6.05
 19. P 5
 20. $143\frac{1}{2}\%$
 21. P 1.50
 22. $31\frac{2}{11}\%$
 23. P 182
 24. P 2.63

25. P $47\frac{1}{2}$
 26. P 2
 27. P 30
 28. Juan, P $2\frac{1}{2}$;
 Pedro, P $2\frac{1}{2}$
 29. Balangot slip-
 pers;
 P 32
 30. P 45
 31. P 2.50
 32. 1.03
 33. P 50
 34. P 10
 35. 27 days
 36. 5 days
 37. P 1.50

Page 190*Sec. 19*

1. 216
 2. 1024
 3. 64
 4. 2401
 5. 6561
 6. 15,625
 7. 2187
 8. 32,768
 9. .00000016
 10. 42.875
 11. .000000064
 12. 1.1881
 13. $\frac{1}{11}$
 14. $\frac{1}{11}$
 15. $18\frac{1}{8}$
 16. $47\frac{1}{2}$
 17. 1.030301
 18. $3\frac{1}{8}$
 19. 3515.3041
 20. $756\frac{1}{2}$

Page 195*Sec. 23*

1. 37
 2. 45
 3. 74
 4. 86
 5. 92
 6. 79
 7. 88
 8. 112
 9. 125
 10. 134
 11. 216
 12. 327
 13. 43.6
 14. 87.2
 15. 5.03
 16. 7.251
 17. 86.05
 18. 631.4
 19. .5027
 20. 74.81
 21. .0089
 22. $\frac{3}{4}$
 23. $\frac{1}{11}$
 24. $\frac{1}{11}$
 25. $\frac{1}{16}$
 26. $\frac{1}{11}$
 27. $\frac{1}{11}$
 28. $\frac{1}{17}$

Sec. 24

1. .360+
 2. .236+
 3. 1.120+
 4. 2.865+
 5. .050+
 6. 1.048+
 7. 1.414+
 8. 2.236+

9. 2.645+
 10. .154+
 11. 1.276+
 12. 1.788+

Page 196*Sec. 25*

1. 250 m
 2. 750 m
 3. 60 m
 4. 92 m;
 184 m
 5. 1200 m;
 200 m;
 1200 m
 6. 66 m
 22 m
 7. 1840 m;
 5520 m;
 3 times
 8. 160 m
 9. 1100 m long;
 220 m wide
 10. 50 m long;
 20 m wide

Page 197*Sec. 27*

1. 95 m
 2. 125 cm
 3. 153 m
 4. 34 ft.
 5. 35 cm;
 49.49+ cm
 6. 36 dm
 7. 5 m
 8. 28.722+ cm
 9. 12.649+ m

10. 353.553+ m
11. 39.255+ m
12. 180.277+ Km
13. 8.660+ cm

Page 201*Sec. 31*

1. 80 m
2. 6.2 m
3. P 66.30
4. P 288
5. 20 m
6. 141.4+ m
7. 699.16 sq. m;
18,500.84 sq. m
8. 3750 sq. cm;
43.301+ cm
9. 108.07+ m
10. 20 cm;
86.055+ cm
11. 8.246+ in.
12. 1350 sq. m

Page 203*Sec. 33*

1. 157.08 cm
2. 235.62 cm
3. 69.1152 cm
4. 128.8056 m
5. 103.6728 m
6. 4.7124 cm
7. 39.27 m
8. 32.672+ cm
9. 117.81 m
10. 1.9635 m
11. 518.364 ft.
12. 389.5584 ft.
13. 141.372 in.
14. 278.97+ m
15. 705.2892 ft.

16. 25 m
17. 16 cm
18. P 157.08
19. 94.248 m
20. 91.1064 cm
21. 2000 turns
22. 106.1+ m
23. 25 cm
24. 160 times
25. 125 cm

Page 204*Sec. 34*

1. 78.54 sq. cm
2. 706.86 sq. cm
3. 1256.64 sq. m
4. 490.875 sq. m
5. 754.7694 sq. dm
6. 2375.835 sq. m
7. 11,309.76 sq. cm
8. 34,636.14 sq. m
9. 5026.56 sq. m
10. 176.715 sq. cm
11. 1590.435 sq. m
12. 33,006.435 sq. m
13. 1256.64 sq. cm
14. 49,087.5 sq. dm
15. 3.1416 Ha
16. 471.24 m;
17,671.5 sq. m
17. 314.16 sq. cm
18. 28.2744 sq. m

Page 206*Sec. 36*

1. 281 $\frac{1}{2}$ cu. cm
2. 260 sq. in.

3. 120 sq. cm;
54 cu. cm
4. 34,201.5 sq. cm;
430,368.875 cu. cm
5. 15.625 cu. dm

Page 207*Sec. 37*

1. 471.24 sq. cm
2. 6126.12 sq. cm
3. P 11.82
4. 17,671.5 cu. cm
5. 70.686 Hl
6. 40 cm
7. 22.4 m

Page 209*Sec. 38*

1. 960 sq. cm;
1536 sq. cm
2. 20 sq. dm;
26 $\frac{1}{2}$ sq. dm
3. 1600 sq. in.;
2624 sq. in.
4. 376.99+ sq. cm;
553.70+ sq. cm
5. 628.32 sq. cm;
942.48 sq. cm
6. 942.48 sq. cm;
1649.34 sq. cm
7. 150 sq. in.
8. 180 sq. dm
9. 576 cu. cm
10. 36 $\frac{1}{2}$ cu. dm
11. 27,337.5 cu. cm
12. 769.692 cu. ft.

13. 201.0624 cu. cm
14. 301.5936 sq. cm;
301.5936 cu. cm
15. 384 sq. cm;
384 cu. cm

Page 210*Sec. 39*

1. 314.16 sq. cm
2. 1385.4456 sq. cm
3. 706.86 sq. ft.
4. 615.7536 sq. cm
5. 15,393.84 sq. in.
6. 1963.5 sq. cm
7. 254.4696 sq. dm
8. 13.854+ sq. ft.
9. 40 cm
10. 904.7808 cu. cm
11. 381.7044 cu. cm
12. 4.849+ cu. ft.
13. 179.5948 cu. in.
14. 7238.2464 cu. dm
15. 523.6 cu. cm
16. 1767.15 cu. in.
17. 8181.25 cu. cm
18. 4849.0596 cu. in.
19. 65,450 cu. cm
20. 502.656 cu. cm

- | | | | |
|---------------------|-----------------------|---|---------------------------|
| 21. 633.346+ g | 16. 2268 g | 5. 28,140; | 3. 24.90106; |
| 22. 113.0976 cu. cm | 17. 3769.92 cu. cm | 1372 | 10.20306 |
| 23. 13.783+ Kg | 18. 2,592,100 cu. m | 6. $35\frac{2}{3}$; | 4. 12,000; |
| 24. 804.2496 sq. cm | 19. 20 cm | 33 $\frac{1}{2}$ | .458 |
| 25. .5286 | 20. 21.362+ Kg | 7. 12 $\frac{1}{2}$ | 5. .2875; |
| 26. 62.832 cm; | 21. 628.32 sq. cm | 8. 40 | 1408 |
| 1256.64 sq. cm | 22. P 56.55 | 9. $3\frac{1}{2}$; $\frac{4}{5}$ | 6. .0645 |
| 4188.8 cu. cm. | 23. 35,437.248 cu. cm | 10. 90 | 7. P 170.10 |
| 27. 5.969+ Kg | 24. 47.124 Hl | 11. 80 | 8. 224 chickens |
| 28. 2 to 3 | 25. 589.05 Kg | 12. $\frac{1}{2}$; $\frac{3}{8}$; $\frac{1}{4}$ | 9. 5.2 Hl |
| 29. 9 in. | 26. 13.4+ cavanese | 13. $\frac{1}{2}$; $\frac{1}{4}$; $\frac{1}{8}$ | 10. 36 m |
| 30. 4 ft.; | 27. 1.8 m | 14. 440; 279; 913 | 11. 16 $\frac{1}{2}$ days |
| 33.51+ cu. ft.; | 28. 27.32+ sq. cm | 15. P 53 $\frac{1}{2}$ | 12. 222 Kg |
| 6702+ lb. | 29. 150 to 78.64 | 16. P 21,420 | 13. 1200 times |
| | 30. P 6.28 | 17. Horse, P 75; | 14. 4.8 |
| | 31. 1047.2 cu. in. | Cow, P 45 | 15. .0625 |
| | 32. 42.875 cu. ft. | 18. P 13.33 $\frac{1}{2}$ | 16. 25 men |
| | 33. 62.3538+ sq. cm; | 19. P 2 $\frac{1}{2}$ | 17. 7.8 m |
| | 242.3538+ sq. cm | 20. 2, 2, 3, 5, 19; | 18. .025 |
| | 34. 5 in.; | 2, 3, 5, 7, 11 | |
| | 96 sq. in. | 21. 105 | |
| | 35. 16 cm; | 22. 4200 | |
| | 3072 cu. cm | 23. 12 $\frac{1}{2}$; 2 $\frac{1}{2}$ | |
| | 36. 1.5 m | 24. 24 days | |
| | 37. 20 in. | 25. P 71 $\frac{1}{2}$ | |
| | 38. 27 to 1 | 26. A, P 25; | |
| | 39. 25 cm; | B, P 15 | |
| | 4712.4 cu. cm; | 27. 5 $\frac{1}{2}$ days | |
| | 1884.96 sq. cm | 28. 16 $\frac{1}{2}$ Hl | |
| | | 29. 14 $\frac{1}{2}$ m | |
| | | 30. $\frac{1}{2}$ | |
| | | 31. $\frac{1}{2}$ day | |
| | | 32. P 1 $\frac{1}{2}$ | |
| | | 33. $\frac{1}{2}$ | |
| | | 34. 1 $\frac{1}{2}$ days | |
-
- | | | | |
|---------------------|---------------------------|-----------------|-----------------|
| Page 212 | Page 220 | Page 222 | Page 224 |
| <i>Sec. 40</i> | <i>Sec. 42</i> | <i>Sec. 43</i> | <i>Sec. 45</i> |
| 1. 726 sq. in.; | 2. 296 $\frac{1}{2}$ | 1. 494.46425 | 1. 1221; |
| 1331 cu. in. | 3. 128 $\frac{1}{2}$ | 2. 284.18305 | 21.175 |
| 2. 800 cu. cm; | 4. 17,453 $\frac{1}{2}$; | | |
| 528 sq. cm | 36,062 | | |
| 3. 1178.1 cu. cm; | | | |
| 628.32 sq. cm | | | |
| 4. 268.96 cu. in. | | | |
| 5. 1060.29 cu. cm. | | | |
| 6. 8.181+ l | | | |
| 7. 221.25 sq. cm | | | |
| 8. 273.3192 sq. in. | | | |
| 9. P 7.54 | | | |
| 10. 20 in.; | | | |
| 768 sq. in. | | | |
| 11. 20 cm | | | |
| 12. 15 in.; | | | |
| 815 sq. in. | | | |
| 13. 60 in. | | | |
| 14. 78.54 cu. ft. | | | |
| 15. P 45.59 | | | |

- | | | | |
|--|---|---------------------------------|--|
| 2. $14\frac{1}{2}\%$;
$17\frac{1}{2}\%$ | 38. P 2200;
$7\frac{1}{2}\%$ | 6. 11.18+ cm;
175.61+ sq. cm | 9. 4,884,100 pas-
sengers |
| 3. $6\frac{1}{4}$ | 39. P 20,350 | 7. 64 balls | 10. P 2770 |
| 4. 550 | 40. P 30 | 8. P 13.75 | 11. P 36.15 |
| 5. 440 | 41. 424 shares; | 9. P 56.55 | 12. P 107.26 |
| 6. 400 | $6\frac{3}{4}\%$;
5% | 10. P 67.86 | 13. P 7922.40 |
| 7. $42\frac{3}{4}\%$;
$36\frac{1}{4}\%$;
$6\frac{3}{4}\%$;
$\frac{3}{4}\%$ | 42. $10\frac{1}{4}\%$ | 11. 4 m;
37.6992 cu. m | 14. .21 |
| 8. $15\frac{1}{2}\%$ | Page 227 | 12. P 16.61 | 15. 12% |
| 9. P 21 | <i>Sec. 46</i> | 13. 201,062,400
sq. mi. | 16. 13,568 |
| 10. P 30 | 1. $\frac{5}{8}$; .7 | 14. 80.157+ g | 17. 66,729,520 Kg |
| 11. P 61.60 | 2. $106\frac{2}{3}$; $273\frac{1}{3}$ | 15. 10.53 | 18. P 105 |
| 12. $2\frac{1}{4}\%$ | 3. 32 piculs | 16. 62.832 Hl | 19. 40%; P 300 |
| 13. P 650 | 4. $13\frac{1}{2}$ days | 17. 16.022+ Kg | 20. 250 days |
| 14. 46% | 5. 15 cu. dm | 18. 2171.89+ g | 21. 1st, 31,959.552
Kg;
2nd, 82,562.
176 Kg;
3d, 173,114.24
Kg; |
| 15. P 650.25 | 6. 3 yr. 2 mo. | 19. 100 cm | 4th Sup., 311,-
605.632 Kg; |
| 16. P 400 | 7. A, P 420;
B, P 210;
C, P 105 | 20. 140.5;
.0263 | 4th Ord., 828,-
285.056 Kg;
5th, 1,235,769-
.344 Kg |
| 17. P 293.40 | 8. 1000 m | 21. 409.705+ m | 22. P 637.50 |
| 18. $\frac{1}{2}\%$ | 9. 32; 128 | 22. 34.5576 sq. m | 23. 24 days |
| 19. P 55 | 10. 8.2; 12.3 | 23. 43.301+ sq. in. | 24. P 570 |
| 20. P 288.75 | 11. A, P 1424;
B, P 1246;
C, P 890 | 24. 9.4248 m | 25. P 21,420 |
| 21. P 87.50 | 12. A, P 1440;
B, P 1200;
C, P 1200 | 25. 187.445+ Km | 26. P 630.72 |
| 22. $1\frac{1}{2}\%$ | Page 228 | 26. 9 in.
5.678 | 27. 5510.6+ Kg |
| 23. P 4880 | <i>Sec. 47</i> | 27. 4961;
5.678 | 28. 20% |
| 24. P 2091 | 1. 10 cm;
312 sq. cm | 28. 384 sq. in.;
13.856+ in. | 29. P 13,432 |
| 25. 2 yr. 2 mo.
10 da. | 2. 6283.2 cu. cm;
1884.96 sq. cm | Page 230 | 30. P 2494.80 |
| 26. $7\frac{1}{2}\%$ | 3. 400 cu. in. | <i>Sec. 48</i> | 31. 94,341,800
cigars |
| 27. P 375 | 4. 13 in.; | 1. 36 | 32. P 39 |
| 28. P 10.88 | 360 sq. in. | 2. $1\frac{1}{4}$; P 34.17 | 33. P 1458 |
| 29. P 157.58 | 5. 10 cm | 3. 3996 | 34. 16 bottles |
| 30. P 495.83 | | 4. P 59.50 | 35. 7,661,598.2
lb. |
| 31. P 221.04 | | 5. $3\frac{1}{2}$ gantas | |
| 32. P 537.77 | | 6. P 30.87 | |
| 33. P 546.33 | | 7. P 33.30 | |
| 34. P 6752 | | 8. $\frac{3}{4}$ zinc | |
| 35. P 450 | | | |
| 36. $28\frac{1}{4}\%$ | | | |
| 37. $6\frac{1}{4}\%$ | | | |

36. 787.5 lb.
 37. $100^{\circ} 5' 45''$
 38. ₱58,480,000
 39. $21\frac{7}{8}\%$
 40. 1260 Kg
 41. 7 hr. 8 min.
 54 sec.
 42. ₱1560;
 ₱10 per week
 43. 15%
 44. 16 yr. 8 mo.
 45. ₱279.80
 46. 39 Kg
 47. ₱1136.60.
 48. ₱300
 49. ₱9.75
 50. ₱9.87
 51. 64 men
 52. $66\frac{2}{3}$ Kg
 53. ₱.87
 54. Decreased
 ₱6.25
 55. 5670.588 Kg
 56. $1\frac{1}{2}$ hours
 57. $33\frac{1}{2}\%$;
 57,537.55 bales
 58. 105.84 sq. m
 59. $13\frac{1}{2}$ m
 60. ₱324.64
 61. 11.7 m
 62. 200 piculs;
 ₱75
 63. ₱4160
 64. $1157\frac{1}{2}$ cu. in.;
 $661\frac{1}{2}$ sq. in.
 65. 1154.28 cu.cm
 66. 2500.14 sq.cm
 67. $42\frac{7}{8}\%$
 68. 35.847 Kg
 69. 100.5312 m;
 116.2392 m
 70. 270.963 sq. m
 71. 3.8628 cu. m
 72. $1\frac{1}{2}$ mo.
 73. 3 men
 74. 6 p.m.;
 4 p.m.
 75. ₱177.10
- Page 237**
Sec. 49
1. $\frac{5}{8}$
 2. .0045
 3. $\frac{1}{2}$
 4. $55\frac{5}{8}\%$
 5. $\frac{11}{16}$
 6. $\frac{111}{128}$
 7. 24 m
 8. $28\frac{1}{2}$ m
 9. ₱81.60
 10. 84 sq. m
 11. 180 oranges
 12. Lost ₱2
 13. $43\frac{3}{4}\%$
 14. ₱173.57
 15. 2691.34 sq. cm
 16. 1050 revolutions
 17. ₱363.40
 18. ₱40.40;
 ₱60.60
 19. ₱1680
 20. ₱3400
 21. ₱74.56
 22. 9 mo. 9 da.
 23. ₱230.40
 24. 5%
 25. 1 yr. 7 mo. 28
 da.
 26. ₱524.95
 27. ₱16.33
 28. $5\frac{1}{12}$; $4\frac{5}{8}$
29. 6 da. 10 hr.
 56 min. 35 sec.
 30. $16^{\circ} 43' 18''$
 31. $16\frac{2}{3}\%$
 32. 90
 33. 960
 34. ₱75
 35. ₱400
 36. ₱1.15
 37. 10,602.9 lb.
 38. A, ₱450;
 B, ₱600;
 C, ₱800
 39. $1157\frac{1}{2}$ times
 40. 1230 tons
 41. A, ₱1440;
 B, ₱1260;
 C, ₱1080
 42. 2.5 m
 43. 7.8
 44. 80 cm
 45. 12 m
 46. 1728 cu. cm
 47. $151,692\frac{1}{2}$ sq. m
 48. ₱1350
 49. ₱1000
 50. ₱1015.13
 51. ₱90
 52. ₱729
 53. 10 da.
 54. ₱3780
 55. ₱60
 56. $81\frac{2}{11}\%$
 57. $602.82\frac{1}{2}$ sq. cm
 58. The first; $\frac{1}{3}\%$
 59. 5 cm
 60. 3.65; 18.011
 61. ₱174.67
 62. 27.22+ cm
 63. 14 m
 64. ₱134.40
65. 5 m
 66. 138.59+ m
 67. ₱80.75 gain
 68. 20 ft.
 69. ₱30
 70. 97.35 l
 71. ₱225
- Page 242**
Sec. 50
2. ₱1743.04
 3. 88.318287;
 $8969\frac{2}{3}$
 4. $650\frac{2}{3}$;
 .00234
 5. $.066\frac{2}{3}$; $307\frac{2}{3}$
 6. 22,000.73;
 249
 7. $65\frac{1}{2}$ Kg
 8. 1260
 10. 25
1. $7.33\frac{1}{2}$
 2. $1\frac{1}{4}$
 3. $\frac{7}{10}$
 4. ₱4850
 6. 13.925
 7. $\frac{1}{2}$
 8. ₱33.92
 9. ₱6600 each
- Page 243**
10. $1\frac{7}{8}$ da.
 2. 38 min. 12 sec.
 past 5 p.m.
 3. 240 sq. cm
 4. 675 sq. cm
 5. ₱448
 6. ₱30.56
 7. 20.925 tons

8. 3037.5 sq. cm;
11,390.625 cu.
cm
9. P 17,253.75
10. P 1188

3. 4240 barrels
4. P 3280

Page 244

6. P 4840
7. Gained 10%
8. $\frac{3}{4}\%$
9. 75%
10. P 7.50

1. P .018;
P 4.50;
120.8 Kg;
.16 m
2. P .17 $\frac{1}{2}$
3. P 640
4. .04
5. 3 $\frac{1}{2}\%$
6. Lost P 90
7. A, P 144;
B, P 360;
C, P 480

Page 245

8. P 1
9. P 27.20
10. $\frac{3}{4}\%$
2. P 1569.96
3. P 310.10
4. 4 yr. 3 mo. 20
da.
5. 6%
6. P 17.18
7. P 3640
8. P 608.56

9. P 750
10. P 60,000
2. P 21,000
3. P 875

Page 246

4. P 1207.50
5. Each yields
6 $\frac{3}{4}\%$
6. 74 $\frac{1}{2}$
7. P 420
8. 4 $\frac{1}{2}$ da.
9. A, P 1728;
B, P 1584;
C, P 1152
10. 20, 32, 60, 88

1. 121 cm;
1,771,561 cu.
2. 3.75 m [cm.
3. 6000 cu. in.;
2400 sq. in.
4. 785.4 cu. cm;
706.86 sq. cm
5. 14,137.2 cu.
6. P 90.48 [cm.

Page 247

7. 5026.56 sq. cm
8. 16.97+ cm
9. P 131.95
10. 15.973+ Kg
2. 40 %
3. 1st, P 40;
2d, P 60
4. P 864
5. 600 lb.
6. The latter,
 $\frac{5}{8}\%$
7. P 716.04
8. P 513.04
9. 144.56+ ft.

Page 248

10. 533 $\frac{1}{2}$ ft.
1. (a) 8%;
(b) P 576
2. 16 $\frac{1}{2}\%$
3. $\frac{1}{8}$
4. P 638.50
5. P 149.18
6. (a) P 480.20;
(b) 1 yr. 1
mo. 6 da.
7. 494.97+ m
8. 73.59
9. 12 $\frac{1}{2}\%$
10. 9.48+ da.

Page 249*Sec. 51*

1. 83.61 sq. m
2. P 181.44
3. 9.884 A.
4. 283.77 bu.
5. 2118.96 cu. ft.
6. 44.092 lb.
7. 536.43+ revo-
lutions
8. 3.786 Kg;
8.3466+ lb.
9. 1528.2 Kg
10. P 665.80
11. P 94.18
12. P 9.20
13. 28.3 Kg;
62.39+ lb.
14. 486.643+ lb.
15. P 49.30
16. P 3.28
17. 573.989+ lb.
18. 44.092 lb.
19. P 77.44
20. P 17,531.85

21. 2247.19+
cu. cm
22. 14.99+ lb.
23. 7.296+ sq. m
24. 528.262+ gal.
25. 35.273+ lb.
26. 645.16+ sq. cm
27. 11.32 cu. m
28. P 56.66
29. P 6.13
30. P 30.29
31. 4.698+ cav.
939.7+ chupas

Page 252*Sec. 53*

1. 40
2. 128 books
3. P 9.07
4. 1260 da.
5. 10
6. 11
7. 6
8. 23
9. 6
10. 6
11. $n = 8$
12. $x = 9$
13. $x = 4$
14. $n = 8$
15. $y = 12$
16. $n = 2\frac{1}{2}$
17. $z = 2$
18. $z = 3$
19. $n = 21$
20. $x = 4$
21. $x = 3$
22. $y = 2$
23. $y = 4$
24. $n = 32$
25. $z = 12$
26. $x = 5$

Page 255

Sec. 56

1. $x = 3$
2. $y = 30$
3. $x = 2$
4. $z = 4$
5. $y = 7$
6. $x = 2$
7. $z = 6$
8. $y = 7$
9. $x = 8$
10. $z = 5$
11. $x = 7$
12. $y = 12$
13. $z = 18$
14. $x = 6$
15. $y = 3$
16. $y = 3$
17. $x = 18$
18. $x = 100$
19. $y = 21$
20. $z = 12$
21. $y = 10$
22. $x = 6$
23. $z = 8$
24. $y = 5$
25. $x = 7$
26. $z = 10$
27. $x = 4$
28. $x = 27$
29. $z = 4$
30. $y = 24$
31. $z = 9$
32. $x = 30$
33. $y = 8$
34. $z = 5$

Page 256

Sec. 57

1. Tablet, P. 15;
Book, P. 75

2. Pedro, \$.30;
Juan, \$2.10
3. 11
4. 8 of each
5. 9
6. 11
7. 29 of hemp;
58 of sugar
8. 18 of each
9. 12 men's;
24 boys'
10. .64 Ha
11. P 45 in Jan.;
P 90 in Feb.;
P 135 in March
12. 20 of each
13. Cow, P 50;
Horse, P 90
14. 41 girls;
123 boys
15. 21
16. 12; 132
17. 4
18. 21
19. 8
20. José, 12;
Juan, 29
21. 10
22. 20; 40; 60
23. Son, 12 yr.;
Father, 42 yr.
24. A, P 4800;
B, P 2400;
C, P 1200
25. 25; 45; 65
26. Rafael, P. 10;
Pedro, P. 25
27. 43, 33, 23
28. Goat, P 5;
Cow, P 32
29. Width, 50 m;

Length, 250 m

30. A, P 70;
B, P 50;
C, P 25
31. A, 30 yr.;
B, 23 yr.;
C, 35 yr.
32. 211 m
33. A, P 105;
B, P 35;
C, P 140
34. In mud, 10 ft.;
In water, 20
ft.;
In air, 60 ft.
35. 23; 22; 21; 20
36. Sheep, P 4;
Cow, P 36;
Horse, P 76
37. 2460 votes;
3002 votes
38. 75; 79
39. 12; 38
40. 30 men;
90 children;
60 women
41. 53 cm; 47 cm

Page 260

Sec. 58

1. 16
2. 30
3. 96
4. 240
5. 35
6. 70

Page 261

Sec. 59

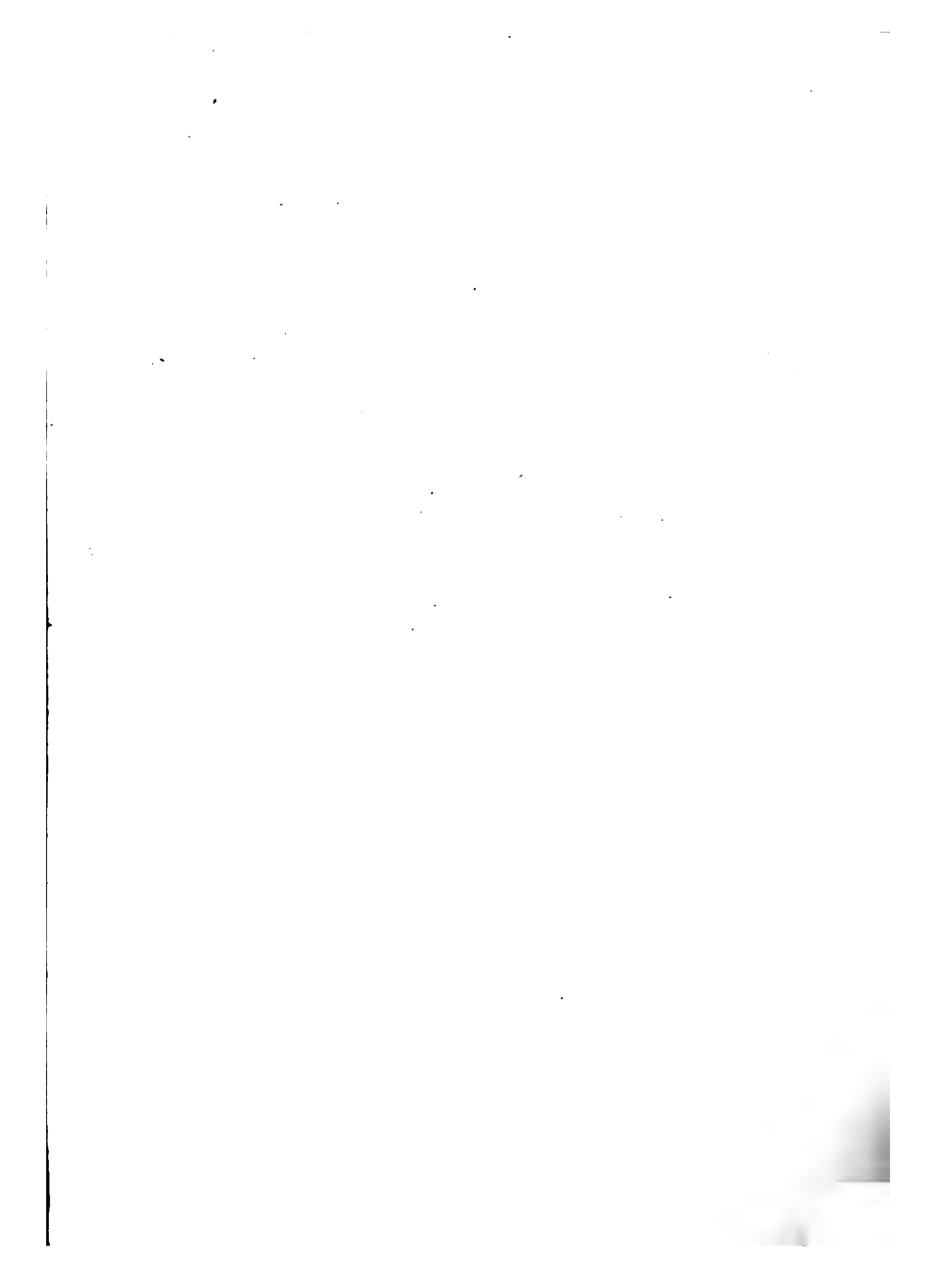
1. $x = 30$
2. $y = 24$
3. $z = 30$

4. $x = 24$
5. $x = 49$
6. $y = 28$
7. $z = 40$
8. $z = 45$
9. $y = 33$
10. $x = 32$
11. $x = 30$
12. $x = 18$
13. $z = 24$
14. $z = 20$
15. $y = 4$
16. $y = 32$
17. $x = 8$
18. $x = 6$
19. $x = 4$
20. $x = 6$
21. $x = 24$
22. $x = 30$
23. $x = 42$
24. $y = 28$
25. $y = 10$
26. $z = 60$
27. $x = 66$
28. $x = 40$
29. $x = 22$
30. $x = 24$
31. 40
32. 64
33. 42
34. 40, 24, 15
35. A, 32 yr.;
B, 24 yr.
36. Width, 150 m;
Length, 250 m
37. A, P 25;
B, P 20;
C, P 22
38. Watch, P 40;
Chain, P 20;
Ring, P 15

- | | | | |
|---------------------------------------|-----------------|---------------------------------|-------------------------|
| 39. 60 sheep;
24 cows;
9 horses | 73. $y = 12$ | Page 265 | 9. $x = 24$ |
| 40. 60 | 74. $y = 60$ | <i>Sec. 61</i> | 10. $z = 40$ |
| 41. 130 | 75. $z = 24$ | 1. 25; 40 | 11. $x = 14$ |
| 42. P 480 | Page 264 | 2. 8 | 12. $y = 30$ |
| 43. A, P 200; | <i>Sec. 60</i> | 3. 40; 160 | 13. $z = 3$ |
| B, P 240; | 1. $x = 16$ | 4. 120 | 14. $z = 14$ |
| C, P 280 | 2. $x = 2$ | 5. 120; 180 | 15. $x = 2$ |
| 44. P 3000 | 3. $x = 5$ | 6. A, P 2.50; | 16. $y = 20$ |
| 45. A, P 3000; | 4. $y = 3$ | B, P 8; | 17. $y = 9$ |
| B, P 2400; | 5. $y = 5$ | C, P 7 | 18. $z = 3$ |
| C, P 2100 | 6. $y = 4$ | 7. 25 | 19. $x = 10$ |
| 46. Horse, P 80; | 7. $z = 2$ | 8. A, P 40; | 20. $x = 1$ |
| Cow, P 50 | 8. $x = 3$ | B, P 80; | 21. $y = 18$ |
| 47. 40 | 9. $z = 13$ | C, P 16 | 22. $y = 24$ |
| 48. 75; 50 | 10. $x = 2$ | 9. 15 | 23. $x = 12$ |
| 49. $x = 24$ | 11. $x = 3$ | 10. $11\frac{1}{2}$ m standing; | 24. $y = 30$ |
| 50. $x = 45$ | 12. $x = 20$ | $18\frac{1}{2}$ m fell | Page 267 |
| 51. $x = 28$ | 13. $y = 10$ | 11. 15; 65 | <i>Sec. 63</i> |
| 52. $y = 6$ | 14. $y = 30$ | 12. Brother, 4 yr.; | 1. 24 |
| 53. $y = 32$ | 15. $x = 12$ | Juan, 17 yr. | 2. 25 |
| 54. $y = 140$ | 16. $x = 50$ | 13. 8 | 3. A, 30 yr.; |
| 55. $z = 30$ | 17. $z = 80$ | 14. Width, 22 m ; | B, 10 yr. |
| 56. $z = 35$ | 18. $y = 40$ | Length, 70 m | 4. A, P 45; |
| 57. $x = 42$ | 19. $y = 7$ | 15. Watch, P 42 ; | B, P 36; |
| 58. $x = 50$ | 20. $y = 4$ | Chain, P 12 | C, P 34 |
| 59. $x = 40$ | 21. $z = 2$ | 16. P 450 | 5. 40 |
| 60. $y = 55$ | 22. $z = 5$ | 17. P 650 | 6. P 4500 |
| 61. $y = 20$ | 23. $x = 2$ | 18. P 350 | 7. P 5400 |
| 62. $y = 12$ | 24. $x = 5$ | 19. 40; 80; 96 | 8. 60; 40 |
| 63. $x = 20$ | 25. $x = 30$ | 20. 20 | 9. 8 20-centavo |
| 64. $z = 12$ | 26. $y = 30$ | 21. 3% | pieces ; |
| 65. $x = 200$ | 27. $y = 28$ | Page 267 | 18 10-centavo |
| 66. $y = 16$ | 28. $z = 12$ | <i>Sec. 62</i> | pieces |
| 67. $x = 24$ | 29. $z = 12$ | 1. $x = 35$ | 10. 350 |
| 68. $y = 30$ | 30. $x = 16$ | 2. $y = 25$ | 11. 70 |
| 69. $y = 50$ | 31. $x = 12$ | 3. $x = 20$ | 12. 12 |
| 70. $z = 44$ | 32. $y = 48$ | 4. $z = 2$ | 13. 10; $12\frac{1}{2}$ |
| 71. $x = 36$ | 33. $y = 18$ | 5. $z = 9$ | 14. Length, 50 m ; |
| 72. $x = 8$ | 34. $x = 24$ | 6. $y = 39$ | Width, 30 m ; |
| | 35. $x = 30$ | 7. $x = 25$ | Area, 1500 |
| | 36. $x = 192$ | 8. $y = 9$ | sq. m |

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|------------------|---------------|------------------------|-----------------|
| 15. 30; 25; 35 | 25. P80 | 34. A, P30; | 10 turkeys |
| 16. A, 20 yr.; | 26. 175 boys; | B, P40; | 45. Rosario, 25 |
| B, 25 yr.; | 160 girls | C, P50 | yr.; |
| C, 15 yr. | 27. A, P1.50 | 35. 60 marbles | Paz, 15 yr. |
| 17. P450 | B, P3; | 36. 80 | 46. 24; 56 |
| 18. Son, 12 yr.; | C, P6; | 37. P750 | 47. A, 45 yr.; |
| Father, 36 yr. | D, P12 | 38. $3\frac{1}{4}$ yr. | B, 5 yr. |
| 19. A, P50; | 23. A, P50 | 39. P6400 | 48. 35; 21 |
| B, P25 | B, P36; | 40. P67.50 | 49. 17; 14; 27: |
| 20. 36; 48 | C, P24 | 41. P4400 | 8; 33 |
| 21. 12; 48 | 29. 9 yr. | 42. 35 yr. | 50. P1600 |
| 22. P40 each | 30. 23, 29 | 43. José, 15 yr.; | 51. 32; 33 |
| 23. P2500 | 31. P90 | Juan, 30 yr. | 52. 31; 32; 33 |
| 24. Cow, P40; | 32. 480 | 44. 20 chickens; | |
| Horse, P75 | 33. 10, 25 | 25 ducks; | |

S. J.





800 24 1834



